AVIATION WEEK

DEC. 31, 195

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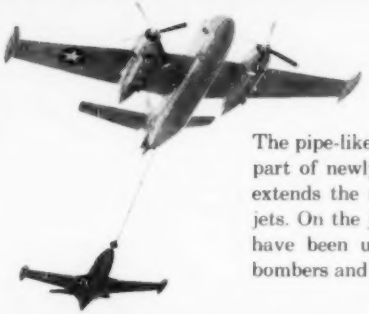


Longer Legs for NAVY PANTHERS

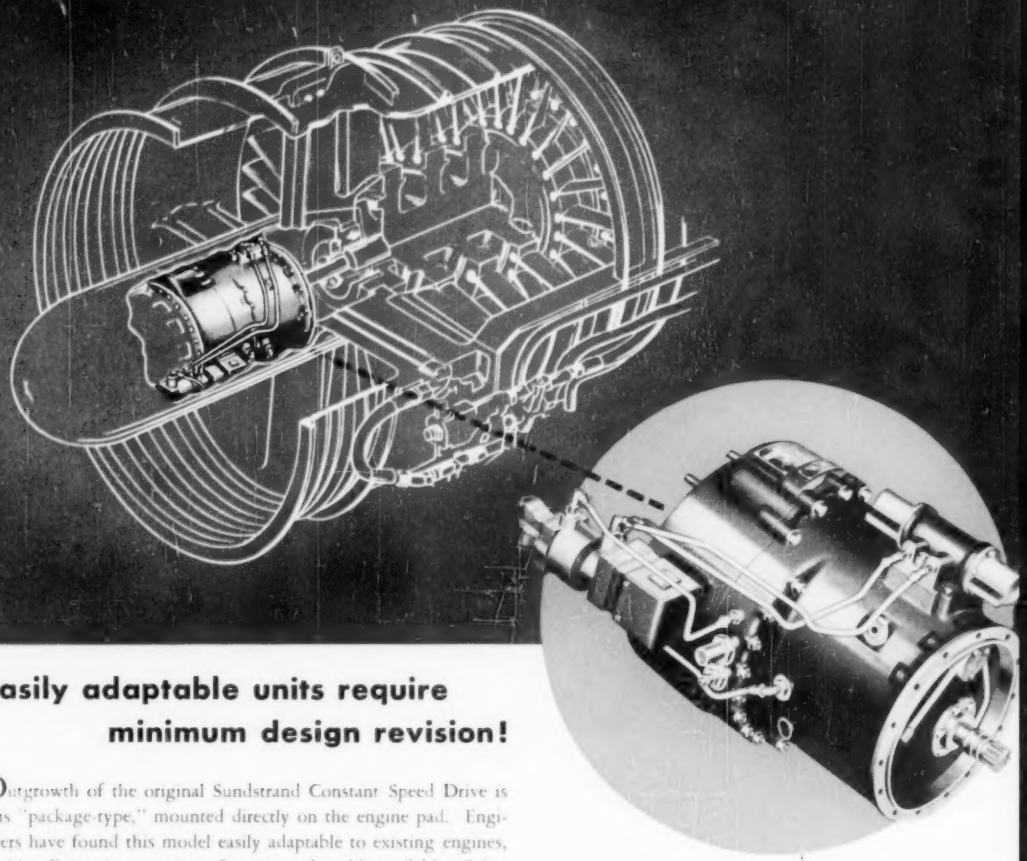
The pipe-like extension on the nose of this GRUMMAN PANTHER is part of newly developed in-flight refueling equipment that greatly extends the range of these hard-working Navy and Marine Corps jets. On the job in Korea since the start of the conflict, PANTHERS have been used on such missions as protection of slower flying bombers and attack planes, flak-suppression and MIG-extinction.

Grumman

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, LONG ISLAND, N. Y.

Contractors to the Armed Forces

DEPENDABLE A-C POWER!...made possible by Sundstrand Constant Speed Drives



Easily adaptable units require minimum design revision!

Outgrowth of the original Sundstrand Constant Speed Drive is this "package-type," mounted directly on the engine pad. Engineers have found this model easily adaptable to existing engines, highly efficient in extraction of power, and readily available. Other Sundstrand drives include the "integral-type" which is designed into the main aircraft engines and uses engine oil, also the "split-drive-type" where the hydraulic pump is mounted on the engine accessory pad, while the hydraulic motor is attached to the generator, remotely located in the airframe. For your best bet on the drive most suitable to your requirements, check on Sundstrand's *reliable* research, *expert* engineering, and *precision* production.

What you can expect from Sundstrand Constant Speed Drives

- Maximum, continuous power for A-C generators, through input speeds of 3000-9000 rpm.
- Any number of A-C generators can be operated in parallel at constant 400-cycle frequency within ± ¼% under steady-state conditions.
- Speeds are synchronized and the load is divided equitably within ± 2 Kw under steady-state conditions—regardless of changes in electrical system loads or acceleration or deceleration of the aircraft engines.
- Completely dependable, fully integrated systems—job-proved on several leading types of aircraft.

SUNDSTRAND

SUNDSTRAND AIRCRAFT HYDRAULICS

SUNDSTRAND MACHINE TOOL CO.
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRANSMISSIONS, PUMPS, MOTORS AND VALVES • OIL BURNER PUMPS • AIR SANDERS
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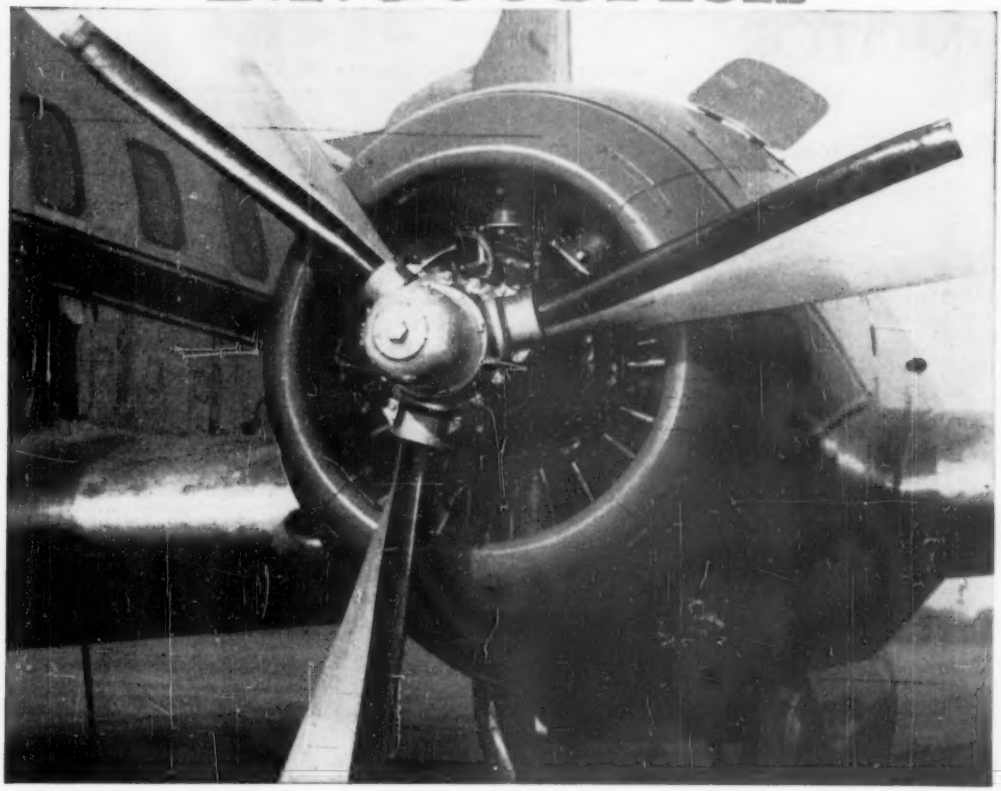
B.F.Goodrich



How B. F. Goodrich makes it hot for ice

SUPPLYING ice protection for any size or shape of airplane part is no longer a problem for B. F. Goodrich engineers. With flexible electric rubber, they can get a skin-tight fit over bulges, around tricky curves and corners.

A B. F. Goodrich De-Icer development, electric rubber can be made only one-twentieth of an inch thick. Its core of electrical resistance wires supplies heat so intense that water droplets hitting will evaporate before they freeze. It is the most efficient method of supplying spot, anti-icing heat. It simplifies design, saves weight, can be cemented on. It requires little power to operate—two lead wires carry the electricity furnished by the plane's regular power supply.

Here are some applications—all of different shapes—where the BFG electric rubber De-Icer has given successful ice protection:

On propellers, (photo above) it prevents ice from cutting down a plane's speed and maneuverability.

In a jet engine's intake, it stops ice from choking off engine air, vital for combustion.

In air scoops, it insures plentiful air supply for cabin heating systems and for cooling engine accessories.

On radio masts, it keeps ice from forming and causing them to snap off in the wind.

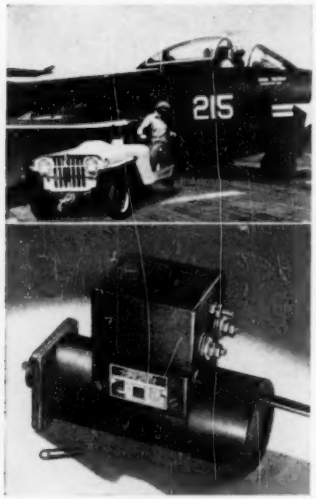
On elevator horns, it keeps them from freezing tight, insures easy control.

The B. F. Goodrich electric rubber De-Icer is also used on wings, hydraulic lines, water tanks, spinner domes, jet intake doors and many other airplane parts. It's a typical development of BFG's engineering and research for aviation. Other B. F. Goodrich aviation products include tires, wheels and brakes; pneumatic De-Icers; Pressure Sealing Zippers; Avtrim; inflatable seals; Plastilock adhesives; fuel cells; Rivnuts; accessories. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER

AIRBORNE MOTOR

powers canopy on Banshee



An Airborne E-2500 motor, with radio noise filter, provides electrical operation of the canopy actuator on the McDonnell Banshee.

Airborne offers two sizes of motors for applications requiring 26 volt, intermittent duty operation. Both sizes feature magnetic clutch and brake for quick stopping and positive holding during "power off" periods.

If you have applications requiring motors of this type, write us. We'll be glad to send you complete information on these products.

Normal 26 volt D.C. ratings for 1 minute on, 10 minute off, duty cycle, without filter.

model	dia.	h.p.	r.p.m.	wt.-lb.
E-2500	2.5"	.75	8000	5.4
E-3000	3.25"	1.25	7000	8.25

AIRBORNE
ACCESSORIES CORPORATION
1414 Chestnut Avenue, Hillside 5, N.J.

Aviation Week

ABP Member ABC

Volume 57 **December 29, 1952** **Number 26**

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INTO 1953...

Seventy-five hundred pairs of TEMCO sleeves are being rolled up for the big job ahead in 1953.

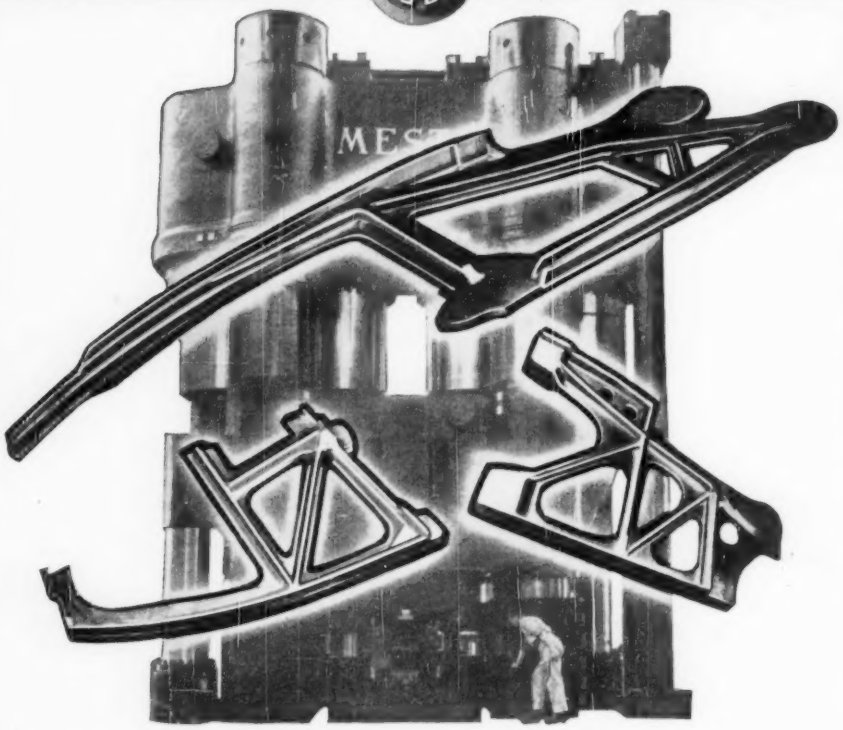
TEMCO is under way on the biggest project of its history as prime contractor for a substantial quantity of McDonnell F3H DEMON jet fighters for the U. S. Navy.

TEMCO made other great strides in 1952 . . . It completed a major installation at Greenville, Texas, for its vast overhaul-modification work on multi-engine aircraft. It further expanded its Dallas manufacturing facilities to provide for a new all-time high production level without loss of time on its Boeing, Lockheed, Douglas and Martin sub-contracts. Its own military trainer, the YT35 BUCKAROO, currently under consideration by the U. S. Air Force, received additional interest from foreign governments. Its subsidiary plant at Garland, Texas, continued to deliver on schedule under sub-contracts from Consolidated, Beech and others.

In the same period, TEMCO design engineers were busy on new projects of even greater scope for America's air defense. In 1952 TEMCO became TEMCO AIRCRAFT CORPORATION . . . 1953 will add new meaning to the name.

TEMCO ® AIRCRAFT CORPORATION

DALLAS, TEXAS



Greater Size and Speed in Aircraft have created engineering problems, the solution of which has required larger and larger forgings of high-strength aluminum alloy. *Examples* shown above are forged structural members used in a modern military bomber, the largest more than seven feet over all. These are forged on an 18,000-ton press, the biggest ever built in this country.

Wyman-Gordon Experience—the most extensive in the industry—is keeping abreast of new forging demands involving the use of Steel, Aluminum, Magnesium, High Density Alloys and Titanium.

• • •

Standard of the Industry for More than Sixty-five Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS DETROIT, MICHIGAN

NEWS DIGEST

New Reverse Prop Proposal Circulated

A proposal to modify all reversing propeller control systems on transport airplanes to prevent inadvertent propeller reversals is being circulated to the industry by Omer Welling, acting chief of the CAA Aircraft Engineering Division.

Proposal involves the Hamilton Standard propeller governor modification with a decrease pitch relief valve (AVIATION WEEK Nov. 17, p. 76). It also involves a rewiring order on Curtiss propellers installed on about 10 Boeing and Convair 240 transports.

The modification is described as similar in operation to a relief valve change proposed by Air Line Pilots Assn. in March 1952. (AVIATION WEEK Apr. 14, p. 84).

Industry has been asked to comment on the proposals by Jan. 5. Date for airline and manufacturers' compliance will depend on how fast Hamilton Standard produces the governor modifications, a CAA official stated.

The Hamilton Standard propeller modification applies to all Douglas DC-6 series and to Convair 240 and 340 airplanes which do not have "lift to reverse" throttles. The proposed directive provides that the propeller reversing control shall be unmistakably different from the motion for closing the throttles.

Domestic

Douglas C-118A Liftmaster (DC-6A) has started trans-Atlantic operations for MATS. Initial flight carried 32 passengers and more than 6,000 lb. of mail from Westover AFB, Mass., to Frankfurt, Germany.

Delta Air Lines has accepted delivery of the first of its 10 Convair-Liner 340s. It marked the twenty-eighth 340 delivered on a total of 175 ordered.

Guided missile training for USAF personnel of USAF Missile Test Center, Cocoa, Fla., has been started by Bell Aircraft Corp., at Buffalo, N. Y.

John C. Nash, 56, who has held numerous posts with Pan American World Airways in Latin America since 1929, died Dec. 13.

An $8-million control center is to be built by Strategic Air Command at Offutt AFB, Omaha, Neb.

DC-4 IS ACCEPTED by Thai Airways Co., Ltd., Bangkok, represented by Maj. Luang Takol Napakas, operations manager (left), who is greeted by C. H. Calhoun, vice president, maintenance and engineering, National Airlines, representing the plane's former owner. William C. Wold, who negotiated the transaction, is in center.

For the second consecutive year Seaboard & Western Airlines is offering $2,000 fellowships at Columbia University's Graduate School of Business for original research in air transportation.

Miss Mae Simpson, 65, widely known in the aviation industry as assistant secretary-treasurer of National Aeronautic Assn., died in Emergency Hospital, Washington, D. C., Dec. 17. She had been on the NAA staff since 1936.

An American Airlines spokesman says it has no plans or agreement to install the newly certificated Lear L-5 autopilot in one of its DC-7s, contrary to published reports. AA recently canceled all but seven of the Sperry A-12 autopilots originally scheduled for use on its 25 new DC-7s as part of a crackdown on unessential equipment which adds to maintenance load.

General Electric Co.'s Lockland plant, near Cincinnati, which manufactures J47 engines, has been renamed the Evendale plant.

Beech Aircraft Corp. has elected the following officers for coming year: O. A. Beech, president; John P. Gaty, vice president and general manager; T. A. Wells, vice president and chief engineer; Frank E. Hedrick, vice president and coordinator; John A. Elliott, secretary-treasurer, and L. Winters, assistant secretary. Beech, Gaty, Hedrick, T. D. Neelands, Jr., Dwight S. Wallace and T. A. Wells retained their places on the board of directors.

Dr. Christopher E. Barthel, Jr., was elected chairman of the board of directors of the National Electronics Conference at the annual meeting held Dec. 10 at Armour Research Foundation of Illinois Institute of Technology, of which he is assistant director.

Financial

McDonnell Aircraft Corp. St. Louis, Mo., has declared a regular quarterly common dividend of 25 cents payable Jan. 2, to shareholders of record on Dec. 26.

Ryan Aeronautical Co., San Diego, Calif., notes net profit of $878,359 for the year ended Oct. 31, more than double that for 1951. Net sales for the current period were $35,068,250, a 57% increase over the previous annual period.

Ryan Aeronautical Co. has recently received $6 million worth of new orders, including $2 million from General Electric for J47 jet components and $1 million each from Douglas Aircraft Co., and Ford Motor Co.

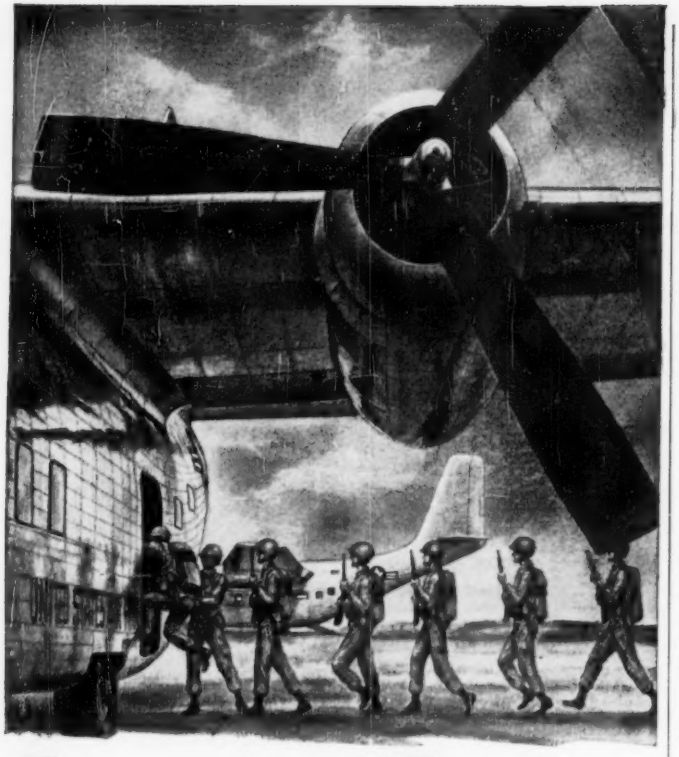
International

Avro Canada CF-100 twin-jet all-weather RCAF fighter flew 1,100 mi. from Ottawa to Winnipeg, Canada, in 2 hr. 49 min., reportedly the longest jet plane flight ever made in the Dominion.

International air cargo service was started by Lome Airways Ltd., Toronto, Canada, from that city to Nassau, Bahamas, and Kingston, Jamaica, B. W. I., using Avro Tudor transport. Meat was carried on initial flights.

Jacqueline Auriol beat her own women's speed mark over a closed 100-km. course when on Dec. 21 she flew a Sud-Est-built DH Vampire Mk. 53 Mistral fighter powered by a Hispano Nene jet engine. Her average speed was 534.375 mph.

The Aeronautical Research and Advisory Council of North Atlantic Treaty Organization held its second meeting in Rome last week. Dr. Theodore Von Karman, chief of the Scientific Advisory Board, Office of USAF Chief of Staff, and Dr. Hugh L. Dryden, director of National Advisory Council for Aeronautics, are U. S. representatives on the NATO research group.



Front Line Express

Chase Assault Transports are designed especially to meet the exacting requirements of the Air Force and Army.

No other planes are capable of delivering vehicles, weapons and troops to forward combat areas ***by landing*** – or evacuating casualties from foxholes direct to rear area hospitals.

AVITRUC - truly the ***front line express.***

Chase AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY
STROUKOFF AVITRUC

AVIATION CALENDAR

Jan. 8-9—Symposium on Industrial Application of Automatic Computing Equipment, sponsored by Midwest Research Institute, Hotel President, Kansas City, Mo.

Jan. 12-16—Annual meeting and engineering display of Society of Automotive Engineers, Sheraton-Cadillac Hotel, Detroit.

Jan. 14-16—AIEE-IRE-NBS Conference on High Frequency Measurements, Statler Hotel, Washington, D. C.

Jan. 15-16—Fifth Illinois Custom Spray Operators Training School, University of Illinois, Urbana, Ill.

Jan. 19-23—Plant Maintenance Conference, Public Auditorium, Cleveland, O.

Jan. 19-23—Winter general meeting of the American Institute of Electrical Engineers, Hotel Statler, New York, N. Y.

Jan. 26-29—21st Annual Meeting of Institute of Aeronautical Sciences, Hotel Astor, N. Y. Honors Night dinner Jan. 26.

Feb. 12-13—National Aviation Education Council annual meeting, Atlantic City, N. J.

Feb. 18—New York Section of the Instrument Society of America, Hotel Statler, New York, N. Y.

Feb. 18-19—Eighth Annual conference of the Society of the Plastics Industry, Reinforced Plastics division, Shoreham Hotel, Washington, D. C.

Mar. 10-11—Eleventh Annual Conference, Society of the Plastics Industry Canada, Inc., General Brock Hotel, Niagara Falls, Canada.

Mar. 25-27—National Production Forum of the SAE, Hotel Statler, Cleveland, O.

Mar. 31-Apr. 2—First International Magnesium Exposition, National Guard Armory, Washington, D. C.

Apr. 4-12—Second Annual International Motor Sports Shows, Grand Central Palace, New York, N. Y.

Apr. 20-23—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering Display (SAE), Hotel Governor Clinton and Hotel Statler, New York, N. Y.

May 11-13—IRE National Conference on Airborne Electronics, Dayton Biltmore Hotel, Dayton, O.

May 18-22—Fifth National Materials Handling Exposition, Convention Hall, Philadelphia.

June 9-11—Second International Aviation Trade Show, Hotel Statler, New York, N. Y.

Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire.

Sept. 14-17—Fourth Anglo-American Aeronautical Conference, London.

Oct. 10—International Air Race, England to Christchurch, N. Z., entry deadline Jan. 31.

PICTURE CREDITS

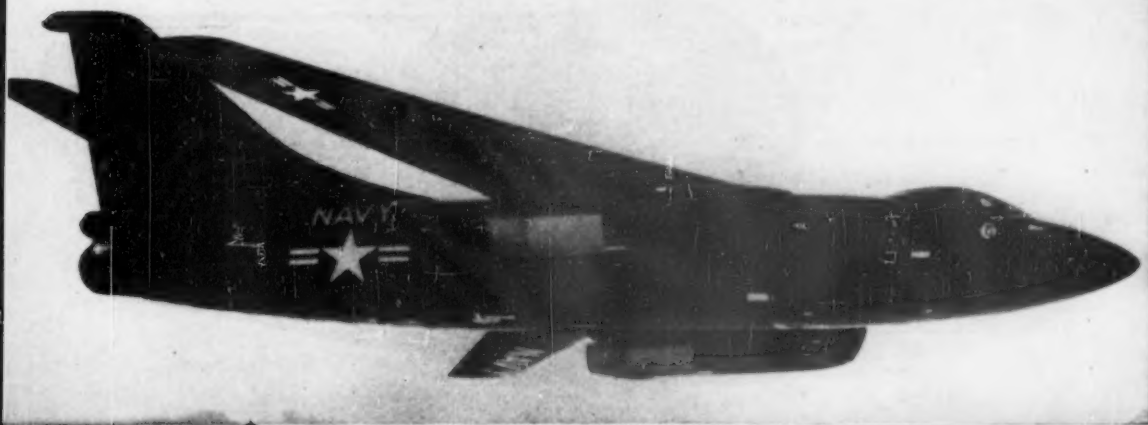
9—(top two) Convair; (bottom) Wide World; 14—Wide World; 15—English Electric; 16—Wide World; 17—Piper Aircraft; 18—Keystone; 21—(center) Wide World; 27—Hughes Aircraft; 31—Northrop Aircraft, Inc.; 48—UAL

SEA TRIALS FOR CONVAIR SEA DART—Radical new Convair XF2Y-1 Sea Dart delta-wing flying boat fighter, world's first, is seen in photos above and below undergoing taxi trials in San Diego Bay. Barely visible under forward fuselage is craft's novel hydro-ski landing gear. Note how spray just misses engine intakes behind cockpit canopy, while XF2Y-1 planes on its hydro-skis at high speed.

Navy's Latest Jet Planes Begin Tests

XF2Y-1 DETAILS—Wings barely above water, the Sea Dart taxis slowly on the bay, permitting a close look at its configuration. Powerplants in the prototype are two Westinghouse J34s. More powerful Westinghouse J46s are scheduled to be fitted later. Navy has ordered a dozen F2Ys in addition to two prototypes. Cost will be approximately $2,250,000 each. (Also see Aviation Week Dec. 1, p. 13.)

DOUGLAS XA3D-1 ALOFT—Big new Navy attack bomber (below) in flight. This view emphasizes sharp sweep of the wings. Powerplants, under the wings in pods, are Westinghouse J40s. USAF version will be the RB-66. Production lines are being readied at Douglas, El Segundo, Calif. A twin 20-mm. cannon turret, radar controlled is fitted in the A3D's tail.



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AIRCRAFT CORPORATION CHULA VISTA AND RIVERSIDE CALIFORNIA

WHO'S WHERE

AIA Elections

Mundy I. Peale, president of Republic Aviation Corp., Farmingdale, L. I., N. Y., has been elected chairman of the board of governors of the Aircraft Industries Assn. for the first half of 1953. Named chairman for the second half is **Oliver P. Echols**, chairman of the board of Northrop Aircraft, Inc., Hawthorne, Calif.

Adm. DeWitt C. Ramsey, USN (Ret.), has been elected AIA president for 1953. Named to the executive committee in addition to Peale, Echols and Ramsey: **Frederick C. Crawford**, president of Thompson Products, Inc., and **Ira C. Eaker**, Hughes Aircraft Co. vice president.

L. D. Webb was re-elected vice president and Western Region general manager and **Harrison Brand, Jr.** was renamed secretary-treasurer.

Changes

Brig. Gen. Henry C. Kristofferson, Pan American World Airways' executive, has been recalled to active duty with MATS for 60 days. He will head a transport operation planning committee.

Paul S. Baker, engineering manager for Chance Vought Aircraft, Dallas, Tex., is leaving the firm at the end of 1952. His future plans have not been announced.

W. C. Smith has been named assistant sales manager of Piper Aircraft Corp., Lock Haven, Pa.

Louis W. Stone has been designated supervisor of field service and training section of Wright Aeronautical division, Curtiss-Wright Corp., Wood-Ridge, N. J.

Walter Van Duyne has been appointed supervisor of the commercial liaison section, **Bernard M. McPeck** has been named assistant manager of the Spare Parts division, and **Kenneth E. Wilkinson** has been given the post of the customer coordination section. **George W. Moore** has been designated sales manager of Electronics division, Curtiss-Wright Corp.

H. Shaw has joined de Havilland Enterprise, Hatfield, England, to handle world-wide liaison with airline operators.

Harry E. Hemler has been transferred to the Glendale (Calif.) division of Grand Central Aircraft Co. as a member of the sales department.

William (Pat) Patton has joined Pastushin Aviation Corp., Los Angeles, as controller.

Bernard Goldman has joined Ford Instrument Co. as senior technical writer in the publications department.

Elected to the Board

John E. Bierwirth, president of National Distillers Products Corp., has been elected a director of Trans World Airlines to fill the vacancy created by the death of the late **Nelson S. Talbott.**

William A. Blakley, Dallas attorney and insurance company board chairman, has been elected a director of Braniff International Airways.

INDUSTRY OBSERVER

► Washington is buzzing with rumors of a substantial presidential cut in the fiscal 1954 budget submitted by Department of Defense. Some estimates place the President's cut as high as $2 billion.

► **Navy has confirmed that Grumman F9F-5 Panthers are in action over Korea. The latest model Panthers powered by the P&WA J48 turbojet recently shot down a pair of MiG-15s from a formation attacking Task Force 77 in the Sea of Japan.**

► Indications are that the first Grumman sweptwing Cougars (F9F-6) powered by the 7,200-lb. thrust version of the J48 will soon be on the way to Korea. The Cougar uses a "flying tail" similar to hydraulically controlled horizontal fin on the F86-E for improved control at transonic speeds.

► **Allison division of General Motors Corp. reports its Turbo-Liner powered by T38 turboprops has logged 175 flights totaling more than 160 hours.**

► Ansco Division of General Aniline & Film Corp. has developed an automatic pilot and made initial flight tests in a Piper Pacer under CAA supervision. Ansco expects to market its autopilot soon for a price of about $1,000, considerably lower than its nearest competitor.

► **Watch for Kellett Aircraft Corp., Camden, N. J., to make a comeback in rotary-wing aircraft. Kellett is reported to have paid off its bankruptcy debts and is now at work with a staff of 250 people on military prime and subcontracts, all in the helicopter field. The corporation also is working on new, advanced rotary-wing designs.**

► Reynolds Metals recently developed an 18-ft. helicopter rotor blade made by an aluminum extrusion process. Price for the new blade in quantity production will be about $65.

► **USAF has consolidated its three overhaul and modification contracts with Hayes Aircraft Co. of Birmingham, Ala., for C-119, C-124 and B-25 aircraft into a single contract that permits USAF to add to the Birmingham workload. Under the new contract USAF buys management service of Hayes for the entire Birmingham center and can schedule additional work on new type aircraft as required.**

► Short S.B.5 variable-sweptwing research type is the harbinger of a British fighter type that probably will be built by English Electric, maker of the Canberra bomber. Other variants of the S.B.5 may appear during the research process.

► **Thompson Products will operate a new jet engine test facility for Navy at Painesville, Ohio, northeast of Cleveland. Construction will be financed by Navy. Purpose of the new lab is to test jet engine components developed by private contractors. Cost is estimated at about $1 million.**

► Cessna Aircraft is studying a spray-duster kit for attachment to its 1953 Model 170 four-seater to enhance its sales appeal for the farm market. The kit would feature detachable tanks suspended under each wing equipped with wind-actuated fans to control the spraying or dusting mechanism. Slow minimum flying speed of the Model 170, aided by large flaps, would help spraying operations.

► **Swedish air force has signed a license agreement to build Rolls-Royce Avon jets for its Saab-32 high-speed attack plane. This indicates the Swedes are abandoning their expensive efforts to build their own jet engine industry by utilizing Swedish engineering ability rather than relying on foreign designs.**

► McDonnell Aircraft's F-101 long-range USAF fighter will have the Pratt & Whitney J57 in its production models.

Washington Roundup

Wait-and-See Period

These developments in Washington, now in the doldrums of the "wait-and-see" period before the new Administration takes over, give some indication of what's to come:

President Truman is putting on the spot Republican economizers who might have a yen to cut deeply into the defense budget he will submit to Congress before leaving office. The defense budget is expected to total between $39 and $41 billion, compared with this year's $46 billion, and will earmark $16.4 billion for the Air Force, compared with this year's $20 billion.

The outgoing President's remarks, indicating Democrats plan to make adequate defense a top political issue:

"Our present defense mobilization program does not even approach the limit of what our country could do if we had to.

"Nevertheless, there has been a great deal of talk about the country's so-called inability to continue a defense program of the magnitude of this one. That is very dangerous talk, because it could conceivably lead this country to a decision to cut back the defense program to a point below the minimum needs of our national security.

"This would happen at a time when we are confronted by a potential enemy that is very hostile and very powerful. And that potential enemy is putting a far greater proportion of his national product into the building of military strength, year after year, than we are. . . .

"The people are wise enough to know the difference between true economy and false economy. They are wise enough to know that anything that may be spent to prevent a new world war is bound to be far less than would be spent to fight one. . . . The people are also wise enough to know that we can afford to pay the cost of whatever is necessary to prevent a new world war. We can afford to complete our defense buildup. We can afford the cost of maintaining our mobilization base in readiness for any emergency."

Defense Leadership

Defense leadership in the Eisenhower Administration will meet the perennial complaint of aircraft manufacturers to the Senate Preparedness Subcommittee that Defense Department now "lacks the know-how of procurement and production. It is composed of too many bankers and lawyers."

Eisenhower's designees for Defense Secretary and Undersecretary, and Secretaries of Army and Air Force are top production men, and Navy Secretary-designate Robert Anderson has had extensive business experience.

Prospect of a wholesale walkout of defense officials on Jan. 20 is causing considerable concern. Some arrangement to keep on certain key men, such as Assistant Secretary for Air John Floberg and Air Force's Undersecretary Roswell Gilpatric, is expected. New officials will be hard put either to support or oppose aspects of the 1953 fiscal year defense budget. Congressional budget hearings start early in February.

Defense Secretary Robert Lovett's firm tactics toward USAF and Navy aircraft programs may have been prompted partially by knowledge that House Armed Services Committee is sitting on a report sharply criticizing the services for buying obsolescent types. Authority for Lovett's action directing cutbacks of old models stems from the provision written into the current year Defense Appropriation Act giving him complete control over military production and procurement. It expires next July 1. There may be a fight over renewal but the heavy odds are the authority will be renewed by Congress.

Smoldering inter-service rivalry, which flared into the open briefly with USAF Undersecretary Roswell Gilpatric's complaint that in addition to Air Force there are three other budding air forces—Army, Navy and Marine—is feeding the already strong sentiment in Congress to give more authority to Defense Department's top command to check service competition and aspiration.

Vice Adm. Arthur Radford's comeback to a key defense policy job under the Eisenhower Administration is hoped for by Naval Airmen. They say he rates high with the President-elect. Credited with masterminding the Navy's 1949 attack on the B-36 strategic air program, Radford was dispatched to the Pacific following the open fight before House Armed Services Committee.

Gen. Benjamin Chidlaw, now head of Air Defense Command, leads in Air Force speculation on a successor to Gen. Hoyt Vandenberg, due to retire as Chief of Staff in April. USAF men report that President-elect Eisenhower already has indicated he wants Lt. Gen. Lauris Norstad to continue service with NATO, with which he has been connected since its start.

Legion Switch

American Legion, which has pressured Congress for universal military training since the end of World War II, is switching to a campaign for a strong Air Force. Sparkplug of the movement: Col. Roscoe Turner, now vice president of National Aeronautic Assn. as well as an active Legion member.

Civil Aviation

Commerce Department is expected to have weak aviation leadership under the new Administration. Robert Blaine Murphy, designated to become Undersecretary for Transportation, is the only member of the top command with any aviation or transportation background. He served in the Air Force during the war, reaching the rank of colonel. Secretary-designate Sinclair Weeks and Undersecretary-designate Walter Williams haven't that much experience with aviation or transportation. Now head of the Pennsylvania Economy League, a privately financed organization to promote economy in government, Murphy probably will apply himself to cost-cutting in CAA.

Nonskeds, members of Air Coach Transport Assn., are forming a legislative committee to push for a rewrite of the 1938 CAA Act to give them recognized standing in air commerce. The committee also will launch a more aggressive fight on scheduled subsidies.

Management Shakeups?

There is talk in aviation circles of:

- A possible shakeup of United Air Lines management, with replacement of the leadership of President W. A. Patterson at issue.
- A possible shakeup of Fairchild Engine and Airplane Co. management, with Richard Boutelle, president, as the storm center.

—Katherine Johnsen

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Services Blueprint Dual-Economy Plants

- **Production Acceleration Insurance Program will assure rapid conversion to 'total war' output.**
- **Funds will be asked to provide 200 aircraft firms with special high-volume standby tooling.**

By Robert Hotz

U.S. Air Force will request funds in its fiscal 1954 budget to begin financing a program to provide the aircraft industry with special high-volume machine tools and production equipment in excess of its current requirements.

This request is part of a joint USAF-Navy Bureau of Aeronautics program known as PAIP—Production Acceleration Insurance Program. Navy's BuAer already has received appropriations totaling slightly more than $1 billion for this purpose since fiscal 1951. The USAF program eventually is expected to be comparable. Navy already has allocated most of its PAIP funds and expects to have most of its industrial stand-by facilities ready by the end of 1953.

▶ **Bottleneck Preventive**—Basic purpose of PAIP is to create enough stand-by productive capacity within the present framework of the industry to make possible a quick acceleration from present production levels to the requirements of all-out mobilization. PAIP is concentrating on critical long lead-time items such as airframes, engines, avionic equipment, guns and bombsights, autopilots, etc.

USAF and the Navy are in effect planning to spend money now to create this stand-by productive capacity as insurance against bottlenecks developing if and when a jump to all-out mobilization goals is necessary.

PAIP recently was endorsed by the Department of Defense and the Office of Defense Mobilization. Both agencies indicated they would support the request for PAIP funds before Congress. Machine tools and production equipment for this program will be delivered only after all requirements for current production needs are fulfilled. Thus the backlog of PAIP tool orders will hit the machine tool industry as its production for the current aircraft program begins to decline.

▶ **Time Saver**—About 200 firms are included in the USAF portion of PAIP. Each firm selected by USAF has done its own planning of what it needs to meet all-out mobilization goals. Each prime contractor participating in PAIP also is responsible for planning the mobilization requirements for all of his key subcontractors.

Prime contractors also will order and distribute to their subcontractors whatever tools and production equipment are allotted them under PAIP. After USAF approves the firm's plan, it will authorize purchase of whatever equipment is required. By placing the machine tools and production equipment in the plants where they eventually will be used rather than in storage depots as was done after World War II, USAF expects to save considerable time in getting the machines into production.

For firms which are a permanent part of the aircraft industry, PAIP will mean purchase of expensive, high-volume tooling instead of the kind actually required by its current production pace. For example, automatic "specials" will be provided instead of semi-automatics or general-purpose tools. More expensive long-life dies will be used instead of cheaper types that would be sufficient for current rates.

For firms which have converted portions of their facilities from civilian to military production, PAIP is aimed at providing a greater degree of flexibility in making this shift and an easier method of producing for both parts of the current dual economy.

▶ **Participants**—PAIP planners are convinced the U.S. will need to continue the present dual-type economy for the forseeable future and it will be necessary to retain the military productive capacity of firms that normally would shift their emphasis to civilian production as military demands diminished. There is a considerable variety of methods by which these dual-type firms will participate in the PAIP program. They include:

- **The dual-purpose-type plant, housing both military and civilian production under the same roof.** This is perhaps the best-known type and is a pet idea of the new Defense Secretary, Charles E. Wilson. USAF has one of this type plant now operating at Kansas City, where F-84 aircraft and General Motors cars are being assembled in the same plant. A Navy dual-purpose-type plant at Arlington, Texas, has been withdrawn from aircraft production.

In a dual-purpose plant, the tools necessary for excess military production will be set up in "cold" lines ready for actual production operation if there is sufficient space, or else stored where they can be moved easily to replace civilian machinery as the need arises.

- **Dual-purpose plant under separate roofs.** This involves construction of a military plant near a civilian plant so labor can be diverted easily from one activity to another. The military plant can be maintained on a standby basis with either a small trickle of production from a "warm" line to maintain a nucleus of supervisory personnel and additional "cold" lines set up for use when all-out production is required.
- **Pilot-line production by licensees of prime aircraft contractors** at an extremely low rate just sufficient to keep up with engineering changes on the basic product with sufficient tools stored and space earmarked to shift to volume production whenever necessary.
- **Perimeter production line** set up for aircraft manufacture around a core of civilian production areas. Some contractors also are earmarking space in their plants for storage of machine tools where they do not have sufficient space now available actually to set up a "cold" aircraft line. All of the various PAIP participation methods are aimed at providing a contractor with the tools and production equipment, factory space and labor that he will need to meet his mobilization requirements.

Although there will be some losses of production equipment due to obsolescence as mobilization goals shift to newer aircraft and equipment models, PAIP requirements are aimed at providing a maximum of flexibility in its tools and production equipment. The program will be readjusted as necessary to meet technical improvements in the aircraft industry.

"This program is simply insurance against being caught short again in a national emergency, as we were when the Korean war began," one PAIP planner explained. "We are spending these funds to buy time if and when we have to speed up to all-out mobilization."

CAA Says Radar Needs 'Saucer' Filter

Similarity between radar targets produced on scopes by helicopters and atmospheric temperature inversions may require a new radar accessory enabling air traffic controllers to spot the difference, a Civil Aeronautics Administration report says.

The technical report, compiled by R. C. Borden and T. K. Vickers of the Indianapolis Technical Development Center, says "flying saucers" observed on traffic control radar last summer were simply secondary reflections of the radar from isolated refracting areas in the temperature inversion level.

Observance of unidentified moving targets on radar scopes is neither new nor unusual, the CAA report noted, but before the "flying saucer" era these were called "ghosts, pixies or angels." Correlation of radar observers' reports with the U. S. Weather Bureau records indicate that a temperature inversion almost always was noted when such targets appeared on the scope.

▶ **Radar Reflections**—"First-hand observation in the tracking and subsequent motion analysis of 80 targets of this type indicated that a large number of these targets were actually secondary reflections of the radar beam," the report said. "Apparently these reflections were produced by isolated refracting areas, which traveled with the wind at or near the temperature inversion levels.

"Although the exact size, shape and composition of these isolated areas is not known, it is believed that they may be atmospheric eddies produced by a shearing action of dissimilar air strata. It appears possible that such eddies may reflect and focus the radar energy with a lens effect to produce small concentrations of ground return with sufficient concentration to show up on the radar display.

"Radar targets of this type are usually easy to recognize because of their generally weak return and slow ground speed. Unfortunately, radar returns from small helicopters sometimes present the same characteristics. Spurious targets of this type can become a nuisance under busy traffic conditions, particularly where helicopter observations are prevalent."

▶ **Weather Cause**—The report noted that during last summer's heat wave the weather in the Washington area was dominated by a high-pressure area with a resultant lack of cloud cover. This condition promoted solar heating in the daytime and rapid radiation cooling of the surface at night. The combination usually resulted in formation of temperature inversions during hours of darkness.

In addition to the Washington sightings, CAA radar observers at Chicago, Cleveland and Boston also reported unidentified radar targets. All said the targets coincided with temperature inversions or were sighted when low smoke palls from the cities hung over the airport area.

AFT SECTION of crashed C-124 remained comparatively intact, contained most survivors.

Four Generals Probe C-124 Crash

USAF assigned four generals, including its top-making safety men, to head a full-scale probe into the cause of the crash of a Douglas C-124A Globemaster II shortly after takeoff from Larson AFB, Wash., Dec. 20, with loss of 86 military personnel.

Base observers speculated that the plane may have been hauled into the air before it attained sufficient flying speed. It seemed to stagger up to approximately 100 ft. altitude, then stalled and fell to the ground about two miles from takeoff.

The death toll was believed to be the largest in a single plane crash in aviation history.

Heading the Air Force investigation were Maj. Gen. V. E. Bertrandias, deputy inspector general for flight safety, and Brig. Gen. Richard J. O'Keefe, director of flight safety research, both of Norton AFB, Calif.

One crew member, S/Sgt. Joseph Skrzyniarz, assigned as instrument panel scanner, was thrown clear of the plane into a snowbank, and suffered an arm injury. Most of the other 29 survivors were in the tail section of the plane, which was torn loose from the forward fuselage. The scanner reported "we seemed to be losing power."

Plane was starting for Eglin AFB, Fla., with stops en route scheduled at San Antonio, Stewart AFB, Tenn., and Donaldson AFB, S. C.

Other high-ranking participants in the investigation were Maj. Gen. R. W. Douglas, commander of the 18th Air Force, to which the plane was attached, and Maj. Gen. H. L. Sanders, deputy commander of Tactical Air Command.

Air Labor Contracts Due for Change

Escalator clauses in the North American, Douglas, United Aircraft and other aviation manufacturers' labor contracts will be revised by February because the Bureau of Labor Statistics is putting out a new cost-of-living index. Most escalator contracts are tied to the present BLS index and call for revision under a new index.

There are two major index changes:

• It will measure the rise in living costs after World War II, instead of since prewar 1935-39. With a new base period of 1947-49 equal to 100, the index figure will be around 115 instead of 190, where it now stands using the old standard.

• The "market basket" has been changed. BLS will price things it never included before, such as the cost of home ownership, home maintenance and used cars. It will survey prices in 46, instead of 34, cities and will include some medium and small cities. And it will change—according to recent changes in family spending habits—the importance of various expenditures in the total cost-of-living picture.

▶ **Steadier Index**—Result: The index will not fluctuate as much as it has in the past. Aircraft escalator clauses usually provide for an adjustment of one cent an hour for every 1.14-point shift in the index. Cost of living is going to have

to fluctuate almost twice as much, percentagewise, to cause the new index to move 1.14 points.

How to reflect this change in the escalator formula will be the subject of labor-management negotiations. Index tables in contracts will also have to be revised to accommodate the new and lower index figures.

BLS is dropping the old index in December. The January index will not be announced until February. For those who want to stick to the old prewar base of 1935-39, BLS also will publish during 1953 the new index with that base. This will allow more time to shift to the postwar base. But the "market basket" of goods and services being priced will be the new not the old.

Ford Gets Contract Increase for J57s

Air Force recently increased by $20 million its contract with the Ford Aircraft Engine Division for manufacture of Pratt & Whitney J57 turbojet engines. The increase boosts to $97 million total funds allocated for jet production at Ford's Chicago plant.

John Dykstra, vice president of Ford's Machined Products Group, said the first turbojet deliveries are scheduled for February 1954. AF production schedules at the Chicago plant run through the first half of 1955, Dykstra said, and the company is planning production "far beyond that date."

Ford's initial production of P&WA R4360 piston engines for the B-36, C-124 and C-97 will continue for several months, reaching a peak output next year, Dykstra said.

More than 400 machines being used in piston engine production, about half the tool requirements for the pilot line, will be converted later for turbojet output. Ford has ordered more than 200 new machines for its jet pilot line and 250 additional machines are on order for plants supplying J57 parts and subassemblies.

Britannia Cargo Plans

(McGraw-Hill World News)

London—British Overseas Airways Corp. soon will begin using the new turboprop Bristol Britannia as a transocean freight cargo transport.

A BOAC spokesman said the airline's five Britannias on order will provide "the highest standards of speedy freight transport on a world-wide scale." Stratocruisers now carry the bulk of BOAC overseas freight.

The airline also said it expects the Britannias and Comets 1, 2 and 3 to exceed in passenger appeal and economical operation aircraft used by competing lines.

Wright Memorial Observances

Truman presents trophies; urges continued air power buildup; ASA wants more research and planning.

Kitty Hawk, N. C.—Three North American F-86 Sabres flew a formation "sonic boom" dive and pullout over the Kill Devil Hill Memorial to the Wright brothers last week, climaxing the 49th anniversary observance of powered flight.

The high-speed jets nosed over at 45,000 ft. into a dive aimed directly at the pylon, and bounced six staccato thunderclaps down on the crowd attending ceremonies. Two "booms" were set off by each plane, as the wings and the tail successively breached the sonic barrier. It was believed to be the first public demonstration of a faster-than-sound flight by a three-plane formation.

►**More Research Urged**—Arthur F. Kelly, president of Air Force Assn., told a luncheon following the monument ceremonies that more advance planning and research would stretch defense dollars more effectively.

He said a group of scientists calculated in 1925 that from 25 to 33% of the Air Force budget should go for research. Since the end of World War II, Kelly said, the allotment has not been more than 4%. And in the last fiscal year it was only 2%.

"Perhaps with a large initial investment and a concentrated mobilization of brain power in the field of guided missiles, we could save not only many years of effort but billions of dollars in the bargain," Kelly said.

Igor I. Sikorsky, Russian-born designer of the first practical American helicopter and friend of Orville Wright, said the Wright brothers achieved power of flight by proving their ideas in a windtunnel and by using the Kitty Hawk region with its smooth hills and constant wind as a full-scale natural windtunnel for flight research.

►**Truman Presents Trophies**—In Washington, President Truman gave the principal address at the Aero Club's annual Wright Day Dinner and presented awards of the Wright Trophy, the Collier Trophy and the Brewer Trophy. It was the first time in recent aviation history that a President has participated personally in the Wright celebration.

Mr. Truman urged that the U. S. continue to build up its air power and continue to make startling technical advances in aviation to keep the peace.

Lt. Gen. James H. Doolittle, recipient of the Wright Trophy, said air power should be kept pre-eminent and warned that "We cannot afford to gamble as we have in the past that we will have time in an emergency to build up our Air Force."

John Stack, assistant director of NACA's Langley Laboratory, received the Collier Trophy; and Maj. Gen. Lucas V. Beau, Civil Air Patrol commander, received the Brewer Trophy for contributions to aviation education.

In Dayton, the Wright anniversary observance was highlighted by the appearance of Maj. Charles Yeager, first USAF pilot to fly faster than sound (AVIATION WEEK Dec. 22, 1947), and Capt. J. Slade Nash, who recently set the new world's speed record of 699.9 mph., expected to be confirmed soon as an international record.

CANBERRA FAMILY PORTRAIT

Four different English Electric Canberra models seen lined up at the company's field at Warton, Lancashire. From front to back: Mk. 4 trainer, Mk. 5 bomber target marker, Mk. 3 photo reconnaissance and Mk. 2 bomber. The latter is the first production model. Each plane is powered by two Rolls-Royce Avon axial-flow jets. Fuel truck at the end of the line is using a twin-boom setup on the Canberra Mk. 2. Martin is building Canberras in U. S. for the Air Force as the B-57A.

Defense Leaders Under Eisenhower . . .

Harold E. Talbott
Secretary of the Air Force

Roger M. Kyes
Deputy Secretary of Defense

Robert B. Anderson
Secretary of the Navy

Robert Ten Broeck Stevens
Secretary of the Army

Talbott Named AF Secretary

But there still is much speculation on who will be in lower echelons of the Defense Department under GOP.

Speculation is building up over how long the current undersecretaries and assistant secretaries will stay in the Defense Department, Air Force, and Navy after the Eisenhower Administration takes over Jan. 20.

The question was raised at the Pentagon last week after the official announcement confirming Harold E. Talbott, New York industrialist, as Air Force Secretary (as forecast in AVIATION WEEK Dec. 15) and naming these three other men to top government defense posts:

- **Roger M. Kyes,** 46, General Motors executive, as Deputy Secretary of Defense under Defense Secretary Charles E. Wilson, former president of General Motors.
- **Robert B. Anderson,** Texas oil man and ranch manager, as Secretary of the Navy.
- **Robert Ten Broeck Stevens,** New Jersey textile executive and director of General Electric and General Foods, as Secretary of the Army.

Kyes, GM vice president and general manager of its Truck and Coach Division since 1950, is described as an aggressive decision-maker in his company and is expected to carry a heavy load on the operational level for Wilson.

With General Eisenhower's campaign promise to provide more defense at less cost through better management, the new industrial-management team has a big governmental "red tape" cutting assignment for itself. Kyes is expected to wield the scissors.

Anderson was deputy director of purchases for the Army Quartermaster Corps in World War II and was a Texas "Democrat for Eisenhower."

Stevens has been chairman of the Federal Reserve Bank of New York. He served as a Field Artillery lieutenant in World War I and a colonel in Army procurement in World War II.

Talbott was director of aircraft production for the War Production Board in World War II (AVIATION WEEK Dec. 15, p. 14).

All five of the new defense appointees met in Washington last week with their counterparts in the Truman Administration for a policy briefing.

Meanwhile, John A. McCone, former Undersecretary of the Air Force, continues to be mentioned as a possible Defense Department appointee. He has been rumored as a likely candidate for an Assistant Defense Secretary post or returning as Undersecretary of the Air Force, possibly with an agreement that he will succeed Talbott at a later date. Another speculation is that he might succeed to the Munitions Board chairmanship.

Among the present second-level defense executives likely to stay on for awhile, according to Pentagon forecasts, are Roswell L. Gilpatric, Air Force Undersecretary, and John J. Floberg, Navy Assistant Secretary for Air. They may be retained because of their familiarity with their respective air procurement programs. Assistant Secretary of Defense (comptroller) Wilfred J. McNeil, head of the department's Fiscal Department, also is expected to stay on for an indefinite period.

Japs Seek Contract

(McGraw-Hill World News)

Tokyo—Four Japanese former aircraft manufacturers are negotiating with Far East Air Force to handle repair and maintenance of its planes. They are Mitsubishi, Kawasaki, Shin Meiwa and Fuji.

If the deal goes through, it could be the initial step in reviving the aviation firms. It would be necessary to release some Japanese airport and maintenance facilities now being used by FEAF. Financial aid also would be needed.

How Much Air Power for Japan?

USAF says Japan should have independent air force of jet interceptors; Army wants tactical group.

By R. P. (Pepper) Martin

(*McGraw-Hill World News*)

Tokyo—The U. S. Army and the Air Force in Japan are locked in a bitter struggle over what type of air force Japan should have when it rearms. The dispute, reminiscent of inter-service battles once fought in Washington, encompasses these views:

- Gen. Mark Clark's Far East Command headquarters already is building the foundations for a tactical air force to be controlled by the future Japanese army.
- The U. S. Far East Air Force, which has been shut out or has kept aloof from the planning stages of Japanese rearmament, now demands that an independent air force be set up stressing jet interceptors.
- Japanese defense leaders, who are beginning to have a strong voice in their country's military plans, generally support USAF views, but want a much larger air force than most Americans believe economically or strategically desirable.

▶ **The Basic Objective**—There is little or no conflict between Army and Air Force over the basic U. S. objective: a new Japanese army, navy and air force capable of defending the home islands. This is part of the broad U. S. strategic policy of making free Asian countries strong enough to protect themselves from both internal subversion and external pressure, a sort of "hedge-hog" defense system to contain Communist China. Ultimate hope is to ease the drain on U. S. manpower and military potential by using Asians to defend Asian territory against communism.

The dispute in Japan represents a basic conflict among American and Japanese military leaders over this country's defense requirements and a lack of official U. S. policy. Gen. Clark's Security Advisory Section, responsible for the American side of the joint planning, is made up exclusively of Army officers. Even the Air Adviser is an infantryman. Their contention is that Japan should be defended by a large ground army supported indefinitely by the U. S. Air Force. If and when a Japanese air force is developed, according to their concept, it would consist almost entirely of fighter-bombers for close support under Japanese army control.

Japanese military experts strongly oppose this concept. They insist that Japan's defense is essentially the air and naval problem of countering strategic air bombardment and coastal blockade. A small, highly mobile army of possibly 10 divisions is all that would be needed to protect the home islands from actual invasion, they say. The Japanese compare their country's position with that of Great Britain. They say that any future Battle of Japan will be fought as was the Battle of Britain—in the air.

▶ **Prod by USAF**—Most Japanese believed American policy was to deny them any air force. They did not press their arguments about air power strongly in meetings with Clark's advisory staff. Recently, however, Brig. Gen. Charles Banfill, chief of intelligence, Far East Air Forces, entertained a group of prominent ex-officers and suggested Japan should be thinking about the problem of a new air force.

Banfill's remarks reflected Far East Air Force's increasing concern over the trend in military planning for Japan. The National Safety Corps, formerly the National Police Reserve, has an air arm limited to liaison, reconnaissance and artillery spotting. Pilots and maintenance men are being trained at Hamamatsu, Shizuoka prefecture. The force will consist of approximately 120 lightplanes, probably Aeronca L-16s and Ryan L-17s.

Recently, Tokyo Aircraft Co. signed a contract with Fletcher Aviation Corp., Pasadena, Calif. to produce the FD-25 Fletcher Defender, a single-engine close-support aircraft. The Defender, which will be the first plane to be produced in postwar Japan, according to announced plans, is to be sold to non-Communist countries in Asia. But Clark's headquarters hopes to purchase the planes for Japan's new army.

Air Force officers began to see the dim outlines of what they gravely refer to as "the most costly experiment in air history." They recalled that Gen. Clark was a leading exponent in the U. S. of Army-controlled tactical air power. Clark lost that fight. Now, according to Air Force officers, he is quietly attempting to apply in Japan the theory that was rejected in the United States. Air Force officers believe it would be ruinously expensive and a negation of the only practical method of defending Japan, which is to create an independent air force built around an interceptor command.

▶ **Jap Blueprint**—Once the dispute between the Air Force and the Army came into the open, and the Japanese realized they would be permitted to have an air arm, their planners went to work. Japan's National Safety Board, which might be compared to the U. S. Department of Defense, prepared a blueprint of what was wanted:

- 53 fighter groups of 954 jet planes.
- 16 light bomber groups of 288 planes.
- 7½ transport groups of 135 planes.
- 23 patrol and reconnaissance groups of 324 aircraft.
- 4 groups of 16 light flying boats.
- 16 training groups of 288 aircraft.

Estimated cost was enormous, about 300 billion yen ($830 million) for the first year, of which 120 billion yen ($330 million) would be used to purchase aircraft. Maintenance costs would be approximately 200 billion yen ($550 million) a year thereafter. The Japanese did not attempt to disguise their ideas on how much of this expenditure the U. S. should bear. They expect the U. S. to furnish the aircraft, subsidize

FARMER'S HELPER

Piper PA-18-A agricultural lightplane is seen dispensing a high-density spray from its Piper-designed boom suspended beneath the wings. The boom can put out up to 15-gal./acre in a 33-ft. swath or 10-gal./acre in a 50-ft. width. The new high-volume equipment has been especially valuable in applying defoliant on California cotton crops, allowing more sunlight to reach the lower bolls and facilitating mechanical harvesting.

revival of Japan's aircraft industry and pay a substantial share of the annual cost of maintenance.

► **USAF Revisions**—Air Force officers were astonished at the scope of the program. Unofficially they whittled down the estimates, substantially reducing the size of the patrol and reconnaissance force, and virtually eliminating bombers. They also outlined a modest program to build an air force from the ground up.

- First step should be integration of Japanese into the Air Defense Force, now operated solely by Americans. Japs would be given on-the-job training in radar stations maintained by Far East Air Forces in the home islands. As soon as possible, Japanese would take over the entire air warning system.
- A Japanese air staff should be organized and trained to operate and maintain a modern defensive air force.
- Backbone of the air force should be four to six squadrons of jet interceptors, totaling 100-150 planes. With this nucleus, the Japanese could train, organize and develop the air force to meet changing conditions.

The real heart of the program is restoration of Japan's aircraft plants. Far East Air Forces has made the initial move by negotiating with Japanese firms for maintenance and overhaul of American aircraft. Next step should be production of lightplanes while obtaining equipment, training men and preparing for eventual production of jet aircraft. It might be five years before jets would be coming off the production line in any substantial numbers.

Japan's peak production during World War II was in 1944 when 26,364 airframes and 40,034 engines were built. Many of the factories were destroyed by air raids and the rest were closed down or dismantled early in the occupation.

Mitsubishi Heavy Industry, which produced 130 bombers, 100 reconnaissance planes, 250 fighters, 20 transports and 1,500 engines a month at its wartime peak, claims it has sufficient equipment and enough (500) engineers and specialists to accept Air Force contracts for overhaul at any time. Other firms negotiating with the Air Force are Shin Meiwa (formerly Kawanishi Aircraft), Kawasaki Machinery (formerly Kawasaki Aircraft) and Fuji Industry (formerly Nakajima Aircraft).

There is considerable opposition to Japan having any type of air force among those who believe the ex-enemy can not be trusted. These opponents, including a number of influential Americans, believe the only way to guarantee Japan's continued cooperation with the U. S. is to make this country dependent indefinitely on the U. S. Air Force. Other Americans, and many Japanese, believe the cost of building and maintaining an effective modern air force would be prohibitive in view of Japan's limited economic resources.

Tiger Stock Sales Reported to SEC

Sale of 8,200 common and 2,300 preferred shares of Flying Tiger Lines stock by three of the company's directors is reported in a Security and Exchange Commission survey of transactions by firm officials and major stockholders.

The sales were by:

James Davidson, director, 3,700 common shares, leaving a total holding of 4,100 common;

Robert Prescott, president and director, 1,500 common shares, leaving a total holding of 13,228 common;

T. J. Sullivan, director, 3,000 common and 2,300 preferred shares, leaving a total holding of 2,592 common.

Other transactions reported by SEC:

Air Associates, Inc. Sale of 26,676 common shares by Gilbert Colgate, director, leaving a holding of 20 common.

All-American Airways. Purchase of 200 common by Everett Arnold, officer, making a total holding of 700.

Boeing Airplane Co. Purchase of 117 capital shares by A. F. Logan, officer, making a total holding of 300.

Braniff Airways. Sale of 50 common shares by Hal Thurman, director, leaving a holding of 2,271.

Cessna Aircraft Co. Sale of 1,300 common shares by Dwane Wallace, president and director, leaving a holding of 75,000.

Colonial Airlines. Purchase of 500 capital shares by Branch Dykes, making a total holding of 500.

Consolidated Vultee Aircraft Corp. Sale of 200 common shares by G. T. Bovee, officer, leaving a holding of 1,500; sale of 800 common shares by LaMotte Cohu, leaving a holding of 3,666.

Douglas Aircraft Co. Purchase of 600 common shares by Arthur Raymond, making a total holding of 600.

International Business Machine Corp. Sale of nine common shares by Sherman Fairchild, director, leaving a total holding of 19,570.

Lockheed Aircraft Corp. Sale of 850 capital shares by D. E. Browne, officer, leaving a total holding of 1,050.

Glenn L. Martin Co. Acquisition of 5,387 common shares by Glenn L. Martin, director, making a total holding of 299,087; acquisition of 45 common shares by Franklin M. Beall, officer, making a total holding of 95; acquisition of 1,847 common shares by Howard Bruce, director, making a total holding of 3,900; acquisition of 640 common shares by William Barclay Harding, director, for Smith Barney & Co., making a total holding of 800.

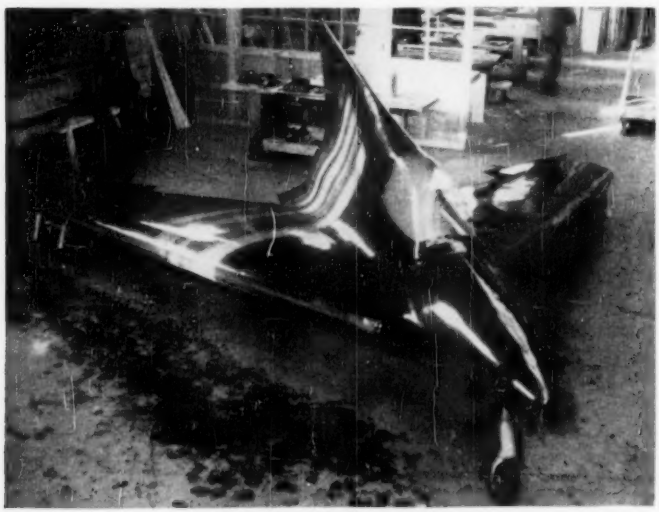
McDonnell Aircraft Corp. Sale of 2,000 common shares by Don Berlin, director, leaving a total holding of 8,180.

Piper Aircraft Corp. Purchase of 1,000 common shares by Norman Greene, director; making a total holding of 3,500.

Sperry Corp. Purchase of 200 common shares by Reginald Gillmor, officer, making a total holding of 600; purchase of 100 common shares by C. M. Green, officer, total holding; purchase of 900 common shares by I. J. Harvey, making a total holding of 1,000.

United Air Lines. Sale of 150 common shares by R. F. Ahrens, officer, making a total holding of 752.

United Aircraft Corp. Purchase of 100 common shares by Frederick Detweiler, officer, making a total holding of 112.



FRENCH DELTA PROJECT

Here is a mockup of a single-seat French delta-wing jet-powered aircraft designed by Paven, who has been responsible for a number of high-speed aircraft in past years. The craft has clean lines, the cockpit canopy making only a slight break ahead of the tail.

Faucett Anniversary

(McGraw-Hill World News)

Lima, Peru—Thirty years ago Elmer J. Faucett made the first flight from Peru's Pacific Coast over the Andes to the Amazon Basin in a borrowed Curtiss Oriole. Up to the end of 1951 his airline, Cia de Aviacion Faucett, had carried 684,679 passengers, 82,465,040 lb. of cargo and 3,033,545 lb. of mail. Passenger mileage totaled 228,441,529.

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Will Prone Flight Lick High G-Loads?

- **We can take greater loads when lying down.**
- **But is that really best position for flying?**

By David A. Anderton

A large portion of combat airplane drag is caused by the pilot's position. Now that wing and tail surfaces have been thinned to the minimum dimension, and huge thrusts come from small-diameter turbojets, the size of a seated man is the governing "drag dimension."

But what if the pilot weren't seated? Prone-pilot ideas have been periodically tried out since the dawn of aviation. Original interest in prone flying was probably inspired by knowledge of increased human tolerance to G-loadings in that position. For instance the average pilot can take about 12G for half a minute or so if he's lying on his face or back. If he is sitting up, he blacks out long before that.

► **Why Prone?**—So about the time designers began to worry about maneuvering at high speeds, they began to consider the prone pilot again. These were the reasons behind their renewed interest:

• **Higher G tolerance.** Lying prone, the pilot can take higher normal G loadings for longer periods of time.

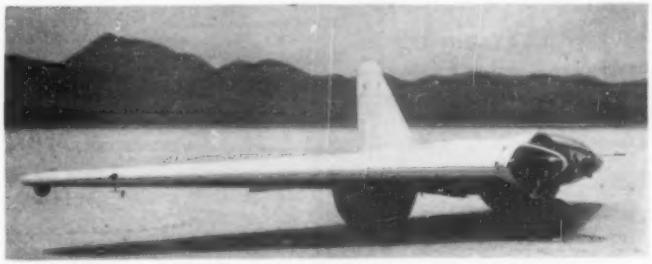
• **Drag reduction.** If the pilot is lying down, he presents less frontal area. Less frontal area means less drag.

• **Psychological advantage.** It seems to be instinctive to lie flat in the face of enemy fire. One of the reasons advanced by proponents of the prone configuration is that the pilot feels more secure than when sitting up.

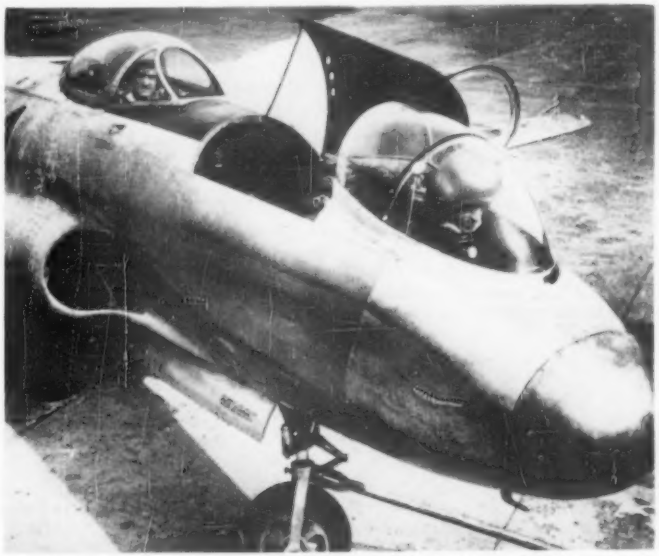
These are the major points; but there are others. Designers point out that by eliminating the canopy—which would follow from a prone-position layout—you eliminate the problems of the canopy. There are none of the worries about sealing at high pressure differentials, or optical distortion or melting due to heating.

Instrument visibility is improved because of the absence of the conventional control column. And not having the column and wheel should simplify the ejection problem, say those familiar with cockpit layout.

► **Drawbacks**—Some of these reasons

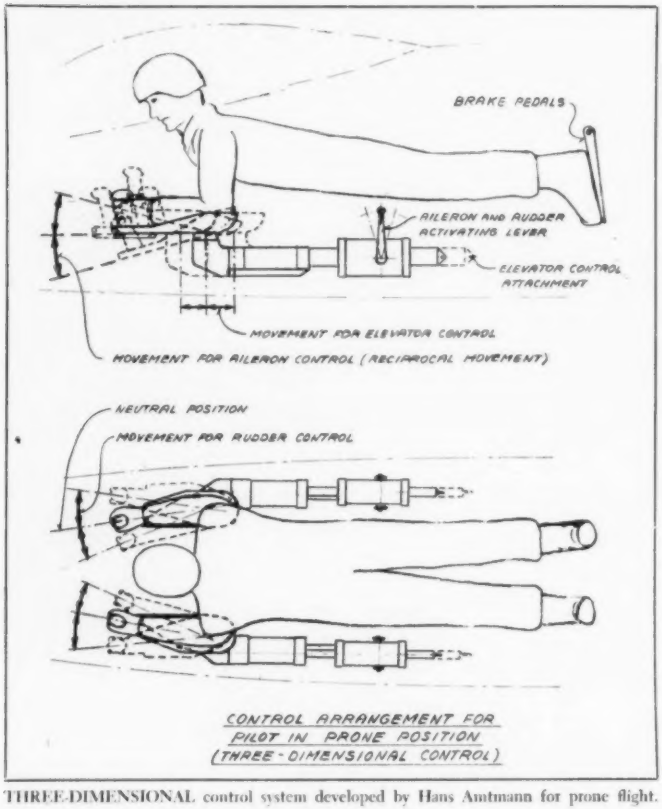


NORTHROP MX-324 rocket-powered craft was used for prone flights in 1944.



MODIFIED F-80F had prone position in its nose. Pilots found it comfortable.

WEE BEE has been used for some years by Beecraft Associates for prone flights.


BRAKE PEDALS
AILERON AND RUDDER ACTIVATING LEVER
ELEVATOR CONTROL ATTACHMENT
MOVEMENT FOR ELEVATOR CONTROL
MOVEMENT FOR AILERON CONTROL (RECIPROCAL MOVEMENT)
NEUTRAL POSITION
MOVEMENT FOR RUDDER CONTROL
CONTROL ARRANGEMENT FOR PILOT IN PRONE POSITION (THREE-DIMENSIONAL CONTROL)

THREE-DIMENSIONAL control system developed by Hans Amtmann for prone flight.

AMTMANN'S CONTROL, installed in F-80E, was operated by pilot's hand motions.

are arguable. Others have been negated by recent developments.

• The development of the G-suit has certainly reduced the argument of increased G-tolerance. High-altitude combat, at today's speed levels, has forced a reduction in G-loadings on pilot and airplane to the point where much more than a 2G turn is impossible because of stall.

• If you eliminate the canopy, some other means of vision must be provided. The complications of a mirror or tele-

radar system could well out-

y advantage realized by

he canopy.

ou stick with a rudimentary canopy and expect the pilot to use it for direct vision, you have a problem. Visual acuity is best when you're standing and worst when you're lying face down. In a prone position, even with chin and neck supported, there is strain on the neck muscles. This strained attitude shows up as a lowering of visual acuity.

• Psychologically, claustrophobia is a very real fear in many people, and this would certainly include pilots. Canopy removal and dependence on artificial vision would aggravate any claustrophobic tendencies.

• Perhaps the final clincher most opponents will fling at you is that the prone position is not a natural one for a man flying an airplane.

▶ **Da Vinci Tried It**—If you dig way back into aviation history, you'll find the prone pilot idea featured in ornithopter designs by Leonardo da Vinci.

Somewhat later, the Wright brothers flew their early aircraft from the prone attitude.

There has been a moderate amount of interest in the idea since then. During the recent war years, studies were made in Germany, notably by the Horten brothers, of prone-piloting ideas. Some of these were used in the flying-wing designs of the Hortens.

In this country, the most serious wartime efforts were made by Northrop Aircraft, Inc. This firm developed the MX-324, a rocket-powered all-wing design in which the pilot lay on his belly. Powered flights were made in 1944. Northrop continued the basic idea in the MX-334 glider and the XP-79 Flying Ram, both all-wing designs.

More recently, Stanley Aviation Corp., Buffalo, N. Y., modified an F-80E to include a prone position in the nose. And in California, Beecraft Associates have been flying their Wee Bee, one of the world's smallest airplanes, from the prone position for several years.

Backing most of the experiments of the past decade is the Aero Medical Laboratory of the Air Materiel Command. From this active Air Force group have come many of the design ideas and initiations that have sparked the program.

▶ **Double Problem**—Basically the design of a prone-pilot position consists of two phases. The first considers the means of supporting the pilot in whatever variation of the prone attitude is chosen. The second develops the special control system needed for flying from this unconventional attitude.

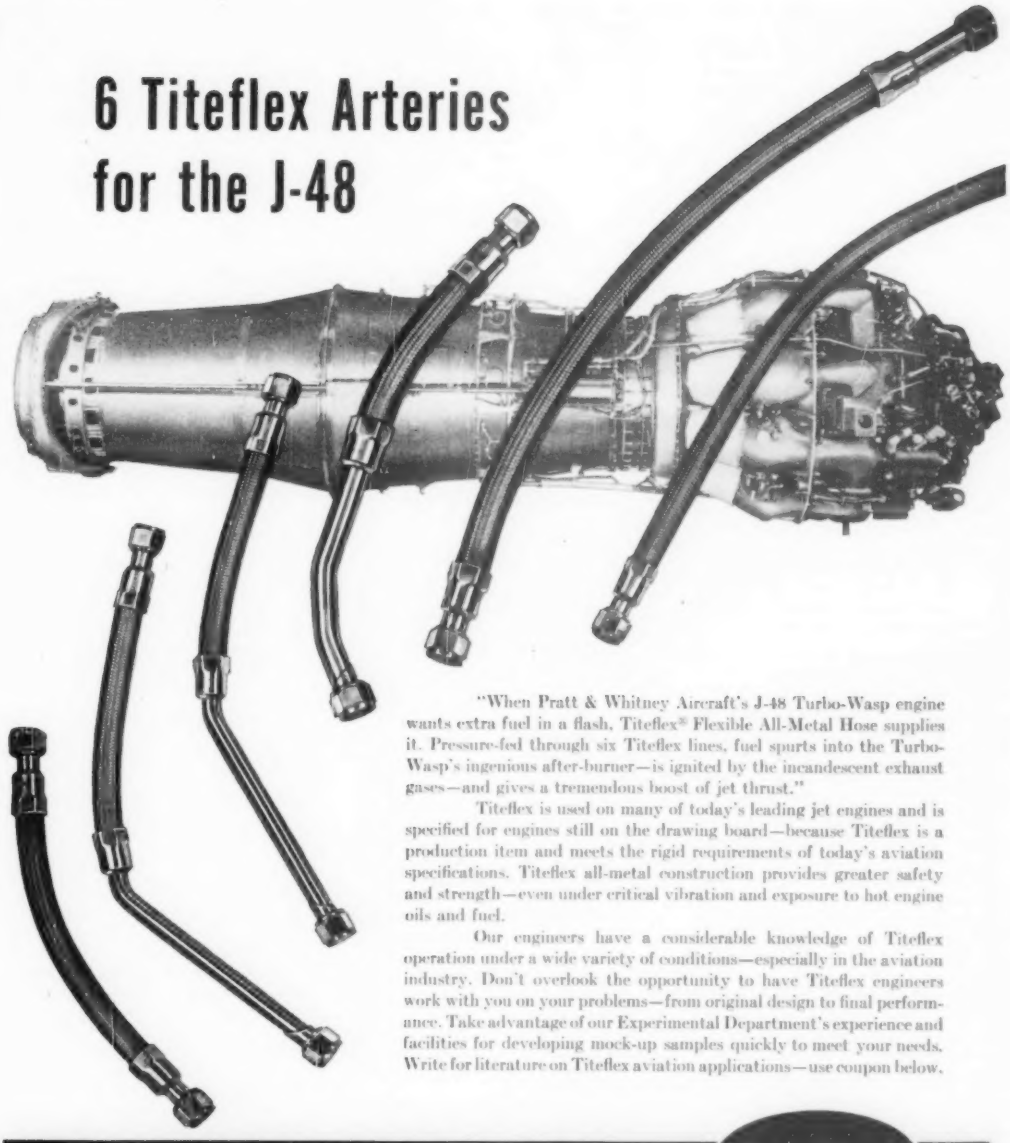
Discomfort has always been a big factor in pilot reaction to the prone position. With actual attitude varying between flat and crouching, early pilot positions were cramped and definitely uncomfortable.

But in 1948, the Aero Medical lab developed a nylon bed, primarily a hammock suspended in a frame which fitted the human shape. In this special bed, the body was supported at an angle of about 30 deg. with the horizontal. The chin support was a pair of foam-rubber pads covered with chamois.

Subjects spent eight to 12 hours in the bed during test periods and reported no particular fatigue. (It might be noted here that if the pilot were considerably larger or smaller than the "average man" whose measurements determined the hammock dimensions, there might be a different reaction.)

▶ **Control System**—Parallel to the bed development, Aero Medical sponsored

6 Titeflex Arteries for the J-48



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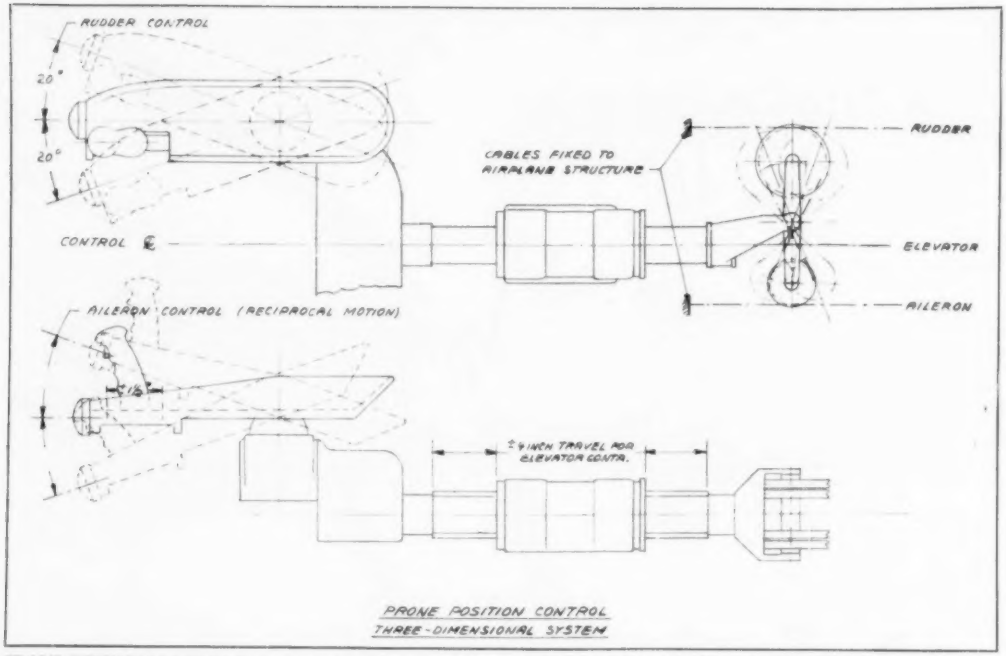


PRONE POSITION CONTROL system by Amtmann was used in tests with modified Lockheed F-80E by Stanley Aviation Corp.

a program for design and construction of a three-dimensional control column for the prone position.

(Three-dimensional control means that all the control surfaces are operated by the pilot's hand motions. In two-dimensional control, foot-operated rudder pedals are used.)

Designer of this system was Hans Amtmann, now at Consolidated Vultee Aircraft Corp., San Diego. Amtmann made his original proposal in 1947 while employed by the Aero Medical Laboratory.

The unit itself was built by Tison Brothers, Los Angeles, and was installed with the nylon bed in an F-80E by Stanley Aviation in 1949.

Amtmann's scheme first called for separate units on either side of the pilot so that the control would be universally adaptable for either prone or seated flight. It also could be built as either two- or three-dimensional control.

As actually built and installed in the F-80E, Amtmann's control column was three-dimensional, applicable only to the prone position, and built as a single unit sliding in a central box.

▶**Description**—In this control system, the pilot rests his forearms on padded control arms. He holds handgrips at the forward end; their position can be adjusted fore and aft to compensate for his armlength. There are no height and width adjustments for the armrests.

To visualize the working of the control system, lean forward in your chair and rest your arms flat on a table in front of you.

Now, if you were flying the airplane, you'd move both arms together back and forth to operate the elevators. You'd move one arm back and the other forward to operate the rudder. And you'd raise one hand and lower the other—pivoting at the elbow—to operate the ailerons.

Incidentally, if while you're doing this you look straight ahead, you'll get some idea of the position of your upper body during a prone flight. You will also be immediately aware of the necessity for special, body-fitting supporting structure.

▶**Flight Tests**—In the airplane it's different. Pilots from Stanley Aviation and from the Air Force flew the F-80E with no discomfort. Pilot reaction to comfort varied between "very comfortable" and "acceptably comfortable."

In all cases, the prone position seemed logical and transition was not difficult.

One of the complaints was lack of vision, serious enough so that one pilot felt unsafe making steep turns. In addition to the loss of direct visual acuity, lying down also reduces the possible head movement. Richard Frost, Stanley's chief engineer and one of the pilots who flew the prone configuration, said that he could see only about 35 degrees either side of straight ahead. This is limited vision. But Frost is also confident that this drawback can be overcome with artificial means, which might even give a better view than the human optimum.

There was one minor complaint. When the pilot had not shaved on the morning of the flight, the chin support chafed him.

▶**Later Tests**—The program lay dormant for a while, and then the Aero Medical people became deeply interested in studies of the subgravity state.

These studies, as the name indicates, are aimed at finding out human reactions under less-than-one-G conditions. This weightlessness would occur in artificial satellites, for example.

Some earlier speculation on human reactions concluded that there were possibilities of motion sickness, and difficulties with orientation and coordination in the subgravity state.

So in the summer of 1951 Aero Medical began a flight-test program to study pilot reactions in this zero- and negative-G range, using the same modified F-80E.

▶**Creating Zero**—Flying an airplane to obtain zero G was rather tricky. Using the airplane speed and altitude conditions as initial parameters, trajectories were calculated which would give no

normal acceleration during the flight time.

It worked this way: With the airplane trimmed for highspeed level flight and with equilibrium established, the plane was pulled up abruptly and power reduced at the same time. Thus the plane arced through the air like a shell after being fired from a cannon.

Flight times were short, varying between 15 and 25 seconds. Both seated and prone pilot were instrumented to get heart rates and electrocardiograms. Accelerometers for all three axes were placed in the cockpits and recorded G within an accuracy limit of plus or minus 1/50G.

The subjects were asked to shake their heads and to nod during the runs at zero G. There were no ill effects following this. But if they did this during the pullout after the subgravity flight, there was frequent vertigo, the pilots reported.

Moderate effort maintained the subject's orientation. But the participants felt that had they been unrestrained and blindfolded, disorientation might have been extreme.

Coordination was unimpaired, although there was a tendency to overreach.

► **High Accelerations**—One of the most important governing factors of space flight will be the ability of the human pilots and passengers to take accelerations during powered flight. In rocket aircraft, acceleration generally begins at a low value and steadily increases to a moderate value over a period of time.

To escape from the earth, accelerations should be as high as possible to reduce time spent—and therefore drag—in the atmosphere and to reduce the fuel needed. It could be done, for example, with a 30G acceleration for 44 sec.

This would be extremely uncomfortable. It could also be done with 3G for nine and one-half minutes. This would be extremely costly in fuel consumption.

Aero Medical lab ran tests in its centrifuge, rather than in the airplane, to determine the tolerance of humans to G-loadings. And while those results were not directly concerned with the problems of prone pilotage, they do confirm the ability of the human frame to take high G-loads in a horizontal position.

► **What Next?**—For the future, the picture looks about the same as it has in the past—sporadic interest, peaks and valleys of proposals and plans.

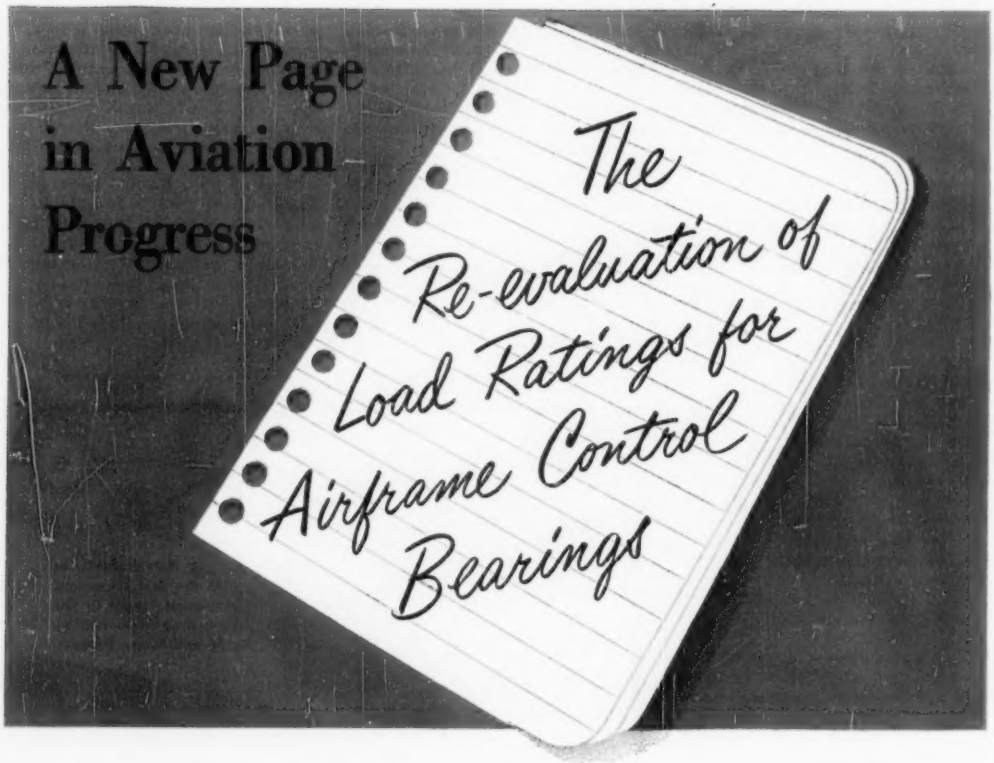
One of the ideas which has been studied by the Aero Medical lab is a prone-pilot delta-wing trainer proposed by Beecraft Associates. They have designed a tiny craft with 140 sq. ft. of wing area and a gross weight of about 1,650 lb. Power would come from two Continental-built Turbomeca Palas turbojets rated at 330 lb. static thrust each. Beecraft believes that its delta-wing layout can broaden the base of prone-piloting experiments because such a plane can out-turn or outmaneuver conventional aircraft.

Its size, weight and powerplants should make it an inexpensive craft to build as a trainer for prone-piloting, and a pilot would get checked out on his equipment easily and at low cost.

Probably the most promising application of the prone-pilot idea would be in the expendable fighter. Here, where size and drag must be absolutely minimized, the reduced frontal area of the prone position would really pay off.

Since such an aircraft would also be expected to pursue the enemy, highspeed maneuverability would impose high G-loads on a seated pilot. Even with the added protection of a G-suit, he might have to be prone to take the gut-rending pull of a tight turn.

Someday when the first space rocket blasts off, the pilots will probably be lying on foam-rubber beds with controls at their fingertips. Their ability to control the craft and to withstand high G may have been proven in advance on trainers like the Beecraft delta which were flown from the prone position.



The Need.
Because of the tremendous advances made in aircraft design and development, ratings for airframe control bearings (An-B-4b) and methods of selection have been under serious study for several years. This study has been conducted jointly by a group of committees representing the Bureau of Aeronautics, the U.S. Air Force, the National Aircraft Standards Committee and the Annular Bearing Engineers Committee. The purpose of the study has been to develop a method of rating airframe control bearings to more closely simulate conditions encountered in actual flight.

The Present Accepted Method.
Selection of control bearings is made solely on the basis of the bearings' static "non-Brinell" (KNd^2) value only — ignoring completely such factors as normal or combined loads, differences in applications, and cycles of oscillation. This method therefore does not provide an accurate rating of individual bearing capacities.

The New Method.
In determining the new load ratings a criterion other than "non-Brinell" is used. Selecting a bearing by means of the new system involves two basic factors: (1) the radial limit-load which should be equal to or in excess of limit load; (2) oscillatory rating or fatigue life of the bearing is checked to insure that the desired average life will be obtained under normal load conditions. This assures the right bearing for each application with increased efficiency and longer service life, often with savings in weight and cost.

The New Method In Use.
Several designers of current fighter aircraft have adopted the new ratings which permit greater use of standard AN anti-friction control bearings than under the old "non-Brinell" system.

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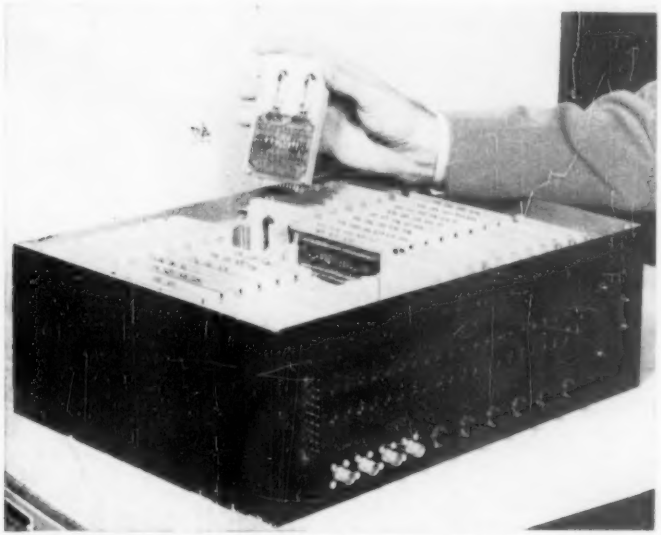
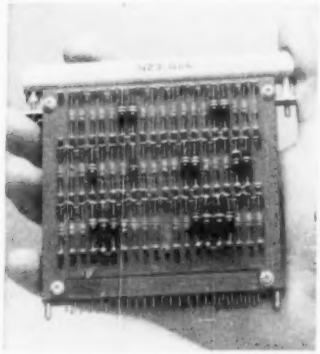
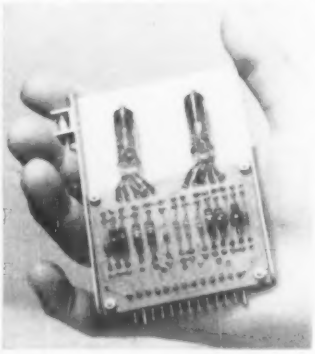


COMPACT CONSTRUCTION makes digital-type computers look good for airborne use.





PLUG-IN SUBASSEMBLIES are built on small flat trays, use printed conductors.

Digital Computer Trend Seen

Versatility, accuracy and producibility give it edge over analog type for fire control and navigation.

By Philip Klass

A Hughes Aircraft Co. digital computer, developed for an unidentified "airborne control system," may indicate a trend toward "digitized" airborne gunnery, bombing, and navigation computers which have previously operated in pure analog fashion. A USAF spokesmen sees great promise in the digital type.

The disclosure that Hughes is working on a digital computer, perhaps the first for airborne use, was made in a recent IRE paper by Dr. E. C. Nelson who heads the Hughes Computer Systems dept. It is noteworthy because Hughes builds fire-control systems for the F-86D, F-94C, and F-89, and is developing a new fire-control system for the Convair F-102 and Republic F-103.

▶ **Analog vs. Digital**—The terms "analog" and "digital" are somewhat ambiguous inasmuch as a "digital" computer solving any real problem becomes in a sense an "analog" computer operating in "digital fashion."

However, as the terms are usually applied, they imply these general characteristics:

• An analog computer is one which simulates a problem, using electrical potentiometers, resolvers, networks, etc., or mechanical linkages and cams. By means of these electrical and/or mechanical analogies, the computer can perform directly such operations as addition, subtraction, multiplication, division, differentiation, integration, and trigonometric functions. Analog computer accuracy depends upon the accuracy of its individual components.

• **A digital computer** works the problem in terms of digits or discrete numbers, but is able to perform only additions or subtractions on these digits. By successive additions or subtractions, a digital computer is able to multiply or divide. By the use of series progressions, a digital computer can approximate, with excellent accuracy, other mathematical and trigonometric operations.

▶ **Analog Disadvantages**—Although analog-type computers have been universally used in gunnery, bombing and navigation, they have several fundamental disadvantages:

• **Accuracy deterioration.** At each stage of analog computation, there is some loss of accuracy. An example is a series of operations performed on a slide rule, where each succeeding calculation incorporates the errors of previous operations.

• **Tailored to one task.** An analog computer is tailored to its specific gunnery, bombing, or navigation problem. For example, an analog-type computer designed for gunnery is not easily adapted to solving navigation problems, and vice versa.

• **Accuracy at expense of size.** Generally speaking, greater accuracy is obtainable only by increasing the physical scale factor of the computer which means using larger (and heavier) components.

• **Difficult to manufacture.** An analog computer usually requires ultra-precision potentiometers, gears, cams, and other mechanical items which are costly and difficult to manufacture and assemble.

▶ **Digital Advantages**—Here's what makes the digital computer look attractive for airborne use:

• **No accuracy loss.** As long as the computer is functioning properly, there is no loss of accuracy, regardless of the number of operations performed.

• **Versatility.** A single digital computing unit can be designed to solve navi-

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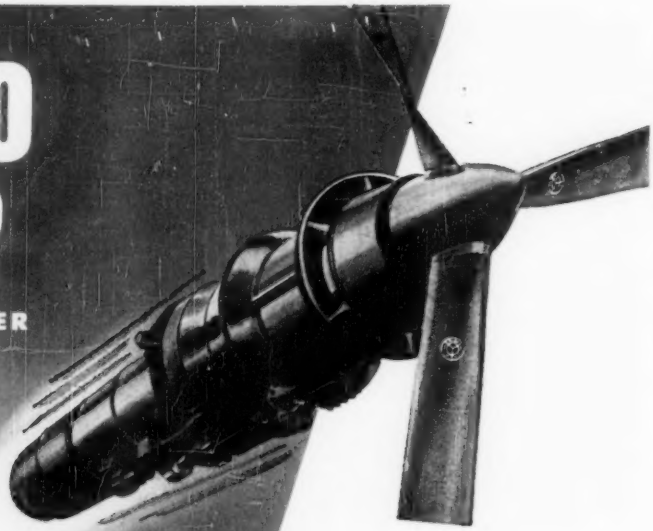

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TURBOLECTRIC PROPELLERS

gation and gunnery or bombing problems and there is little or no weight or complexity penalty for this added versatility. A digital computer could, for example, be used for navigation at the start of a flight; later at the flick of a switch it could be switched to intercept or bombing duties, and still later returned to navigation tasks.

• **Easier to manufacture.** The digital computer is made up of many identical assemblies (flip-flops, networks, etc.) which are easier and cheaper to manufacture than analog assemblies. Digital computer assemblies lend themselves to automatic factory techniques.

• **Potentially more reliable.** Except for its "programmer" which controls the sequence of digital computer operations, and its "memory" which stores data, a digital computer has no moving parts. This makes it potentially more reliable than its analog counterparts. When rugged, long-lived transistors can be substituted for the many vacuum tubes now used in digital computers, much of this potential reliability should be realized. (Use of transistors in airborne equipment is presently limited by their inability to operate at temperatures above 70C.)

► **Major Disadvantage**—The size and complexity of the programming and data storage (memory) elements appears to be the major roadblock in the way of widespread use of airborne digital computers. In ground-based digital computers, these elements have been large and bulky. But for airborne applications, where the computer need solve only several types of specialized problems it should be possible to reduce the size of these elements.

► **Future**—"It is felt by many that the ultimate has practically been reached in the development of analog mechanisms for airborne equipment," Capt. W. H. Rothammer of the Wright Air Development Center writes in the

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New thimble-sized accelerometer can measure shock or vibration over the range of 5 to 5,000 cps. and can operate over the temperature range of —200 to 70C for missile and aircraft research. Accelerometer is available in three models with output signal gradients of 5 or 10 mv. per G; response is flat within ±5% to 5,000 cps. Manufacturer is Endevco, 180 E. California, Pasadena 1, Calif.

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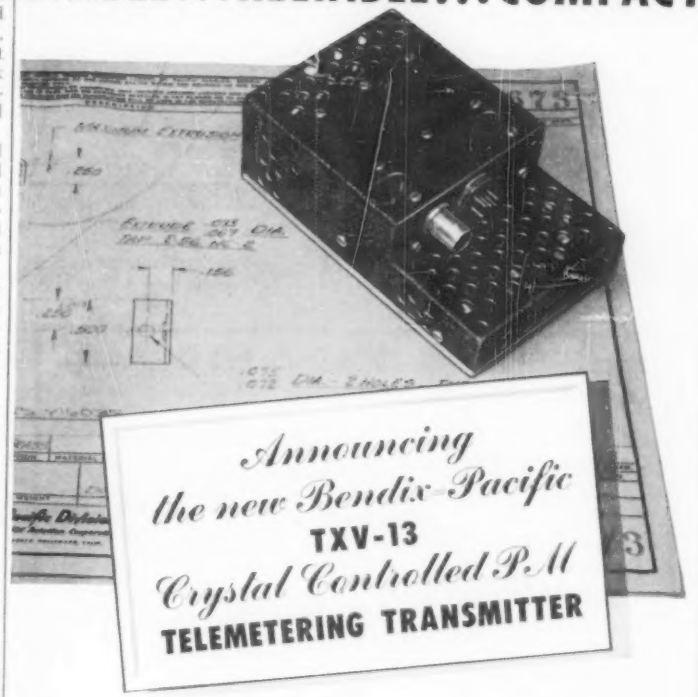

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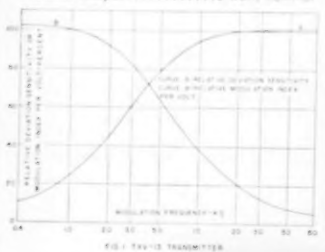

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October issue of the IRE Airborne Electronics Professional Group newsletter.

"In contrast, the exploitation of the digital mechanism has not been seriously undertaken to date, and its possibilities have not been thoroughly explored," Rothammer continues. "It appears likely that various developments will permit substantial reduction of equipment bulk which remains the most serious problem of digital machines. . . . With this bulk problem solved, it is almost certain that the digital computer will secure an advantageous position in aircraft application," Rothammer concludes.

FILTER CENTER

► **New Gyro-Stabilized Platform**—Sperry Gyro is developing a gyro-stabilized platform as a possible high-accuracy replacement for the separate vertical and directional gyros now used in aircraft (autopilot) stabilization.

► **Long-Life Equipment**—Subminiaturized versions of certain standard BuShips electronics equipment, under design by Cornell Aeronautical Lab, are expected to have 5,000 hours life at ambient temperatures of −40 to 120C. Equipment will be able to operate at temperatures as high as 200C, but presumably this would be at the expense of useful life.

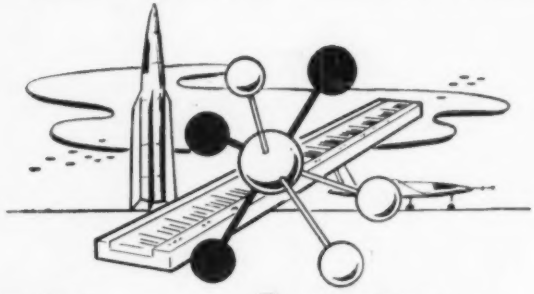
► **Gyro Bearings Eliminated**—Arma Corp. says it is producing gyros without "bearings of any kind," thus eliminating the largest single source of gyro precession or drift error. An Arma spokesman said his company "had already passed through the air bearing stage." This prompts speculation that Arma is either using a vibrating-reed type of gyro developed by Sperry Gyro and disclosed several years ago, or is using magnetic gyro suspension.

► **J73 to Use Scintilla Ignition**—Bendix Scintilla will supply a new high-voltage, capacitor discharge-type ignition for General Electric's new J73 turbojet engine.

► **Reliable Tube Output Up**—General Electric's production of high-reliability vacuum tubes for avionics and military use is up more than 400% since a year ago. Called the Five-Star line, the tubes are an outgrowth of GE's reliable-tube program for Aeronautical Radio, Inc. (Arinc).

► **M-H Sets Up Dallas Group**—Minneapolis-Honeywell has moved a 12-man engineering group to Dallas to work with Chance Vought Aircraft "in developing a new automatic control system of a classified nature," possibly for CVA's Regulus missile. The group, headed by John V. Sigford, a M-H autopilot authority, is expected to double in size. Project will require two years for completion. —PK

Guided Missile Programs Offer Challenging Opportunities



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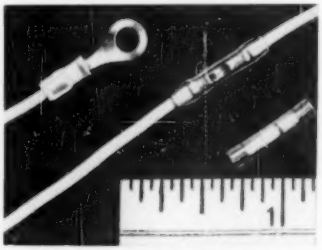

SMALL-WIRE TERMINALS

New solderless terminals and butt-type connectors for small wires sizes (22 to 26) have been announced by Aircraft-Marine Products, Inc. The company says the new tiny terminals are vibration resistant and free from R.F. noise. They come in a variety of tongue shapes with or without pre-insulation. Butt-type connectors for joining two wires use a transparent insulation to permit positive inspection. (Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa.)

Magnesium Gains Favor As Plane Metal

- **Industry group hears of production advances.**
- **Huge cast wing points to new techniques.**

By Irving Stone

The record shows that strong, lightweight, non-strategic magnesium firmly has established itself as a member of the aircraft family of metals. In a relatively short period, engineers have designed this material into an ever-widening field of aeronautical applications. Problems remain, but these are being solved progressively.

The design and production picture showing how extensive these uses have become was focused clearly for a large group of experimenters, processers and users at the Magnesium Assn.'s recent two-day 5th Annual Meeting in New York.

▶ **Cast Wing Tried**—One of the highlights indicating projected thinking for application of the metal is a large, cast-magnesium wing panel now undergoing static tests at Wright Air Development Center. It measures 16½ ft. long, with a maximum width of 43 in. —probably is the largest aircraft surface ever cast.

It was produced under an Air Force-sponsored program to explore the possibilities of using the casting technique —instead of assembly method—for economics in time, cost and materials. Northrop Aircraft, Inc., designed the structure; Aluminum Co. of America cast it from AZ-92 magnesium alloy, to exacting tolerances.

There has been no official designation of the aircraft for which this type of wing is intended, but reports are that it is being investigated in connection with a guided missile. This would be in keeping with Air Materiel Command thinking that castings should play a big part in missile makeup (AVIATION WEEK Nov. 3, p. 37).

▶ **In Halves**—Alcoa's Ward Stewart revealed that the wing panel started out as a one-piece structure—but evolved into a clamshell configuration. Each half has integral spanwise ribs with spaced bosses for mechanical joining of the valves. Weight of about 200 lb. represents about 500 lb. of poured material.

Shell thickness at the root is about ½ in., tapering to ¼ in. at the tip. Recesses are cast into the exterior edge surfaces, apparently for attachment. Surface check has indicated that contour control is as good as could be expected from a formed sheet surface.

ONE-PIECE MAGNESIUM WING, designed by Northrop and cast by Alcoa under USAF sponsorship, is believed to be the largest aircraft surface ever cast.

The finishing scheme called for only minor sanding, with no attempt to do any machining on the outer surface at this stage of development. The panel is reported to have met normal aircraft standards.

As an initial experimental casting, this achievement is significant. It isn't an approach accepted as yet by the aircraft industry; but there's no doubt that it will stimulate thinking for other applications, serving as a model to demonstrate the suitability of large castings of this type.

▶ **Recent Applications**—In other large military aircraft applications, magnesium alloys have played an important role.

• **F-80.** Capt. Dale H. Black of Wright Air Development Center's Aircraft Laboratory, Structures Branch, said seven of 10 wings constructed for an F-80 (AVIATION WEEK July 4, 1949, p. 26) have accumulated more than 1,000 hr. with excellent results. Wing finish gave some trouble, but this was expected. Because of the high speeds involved, practically no paint was left on the leading edge in a matter of a few hours. But new materials, which appear superior, are to be tried for wing refinish. Fuselage, empennage and flaps made of magnesium alloy are to be tested on two F-80's.

• **F9F-2.** A redesigned Grumman F9F-2 wing with an all-magnesium makeup also is being evaluated (AVIATION WEEK, Sept. 1, p. 21).

• **B-36.** In the B-36, magnesium adds up to these weights: airframe sheet and extrusions, 8,300 lb.; airframe and equipment castings, 600 lb.; sheet, forgings and castings in miscellaneous equipment, 100 lb.; wheel castings, 1,710 lb.; powerplants, 3,048 lb.; and turrets, 1,480 lb. Total is 15,670 lb.

• **B-47.** Use of the material on the B-47 is conservative by comparison. Appli-

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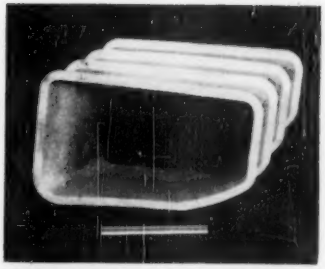


MAGNESIUM castings have been made of ducts (top), waveguides (center) and antenna components (bottom).

cations on this plane have been restricted somewhat to secondary and non-structural parts, involving low business, they have required a mini-About 850 pounds of magnesium sheet is used in each B-47 airframe, but little service data is available as yet. In the advanced series B-47, magnesium has been used in the tail turret structure, takeoff assist panel, camera mount castings and control access doors. Some of the metal has been used as skin on bomb-bay door panels. As a result of severe buffeting, cracks originating at the rivet holes developed after short service life.

Other applications in the B-47 include extensive use of magnesium alloys as forgings and castings in the control system—aileron tab trunnion support, elevator tab wheel, drive support, rudder control pedals, pilot and co-pilot control wheels. Performance has been satisfactory. Most of these parts are cast, and require only a small amount of machining.

▶ **Finish Problems**—When process specs have not been complied with, difficul-

ties have been experienced with finishes on the magnesium—particularly on the B-47 bomb-bay doors. Primer that was too thick, and other effects of poor workmanship, produced poor adhesion, causing the protective finish to peel in large strips. On the leading edge, the metal has stood up very well under rain erosion so long as the finish remained unbroken. But once the finish was broken—usually at riveted butt joints—the sheet would begin to corrode.

Fusion-welded magnesium parts are not used, but spotwelded components are employed, Capt. Black reports. It has been found that the control of spotwelds in magnesium has been more critical than with aluminum because of the bad effects of excessive spot size.

► **Large Use in Copter**—Probably the greatest application of magnesium—percentage-wise in relation to airframe weight—is in the Sikorsky H-19 (S-55). About 17% of the copter's weight—600 pounds of it—is magnesium sheet and casting.

In addition to fuselage skin, there are 98 AZ-63 castings, the largest weighing 8 lb. Black reports that a switch to AZ-91C alloy is being considered because of the material's superior micro-shrinkage characteristics.

Other applications in this copter include the gearbox housing, wheels, almost the entire control system and pilot and co-pilot seats.

Finish consists of Dow No. 7, a single coat of zinc chromate primer, and two spray coats of lacquer. Lap joints are edge-sealed before final painting. Zinc chromate tape is used between dissimilar metal surfaces.

► **In Big Cargo Plane**—The C-124A Globemaster uses magnesium parts extensively, Black says. One large item comprises about 2,000 lb. of ZK-60A extruded beams for the main cargo floor support structure. This application has shortened considerably the manufacturing time for the plane. Smaller magnesium extrusions are used in the cockpit floor structure.

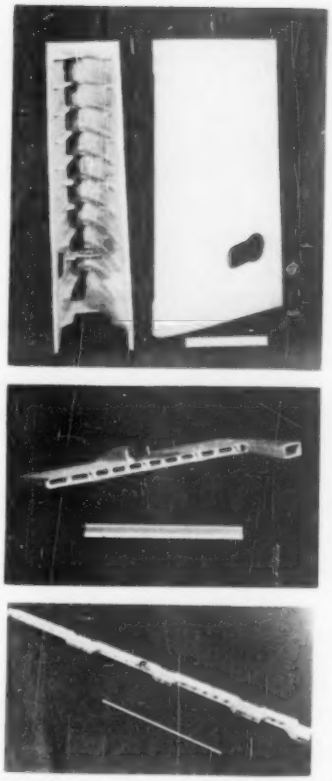
The large extrusions are used just about as received, with some simple mill operations on flanges and the cutting of web holes for lightening. The only parts added are cargo tiedown fittings and plates for attachment of other structural members.

By comparison, a built-up beam in aluminum would have required extrusions for top and bottom caps, webs and stiffeners, Black points out. Special attention would have had to be given to vehicle rolling load concentrations on the cap with the thin web construction. The thick magnesium beam's web acts as a continuous compression member to transfer these load concentrations without additional parts.

► **Corrosion Data**—Early in the C-124 program, some corrosion occurred on the beams. An ingredient in the zinc chromate primer acted as a conductor for electrolytic action with other metals, and the rinse after dichromate treatment needed special attention. Also, the primer did not offer enough protection without a suitable topcoat. If the lacquer chipped off, the zinc chromate wouldn't give adequate corrosion prevention.

Black says a new prime coat of vinyl base has been developed to give better corrosion protection than the zinc chromate and lacquer system used before. Proper rinsing after dichromate treatment was found necessary, and acidity of the rinse water had to be maintained below 6.5 on the pH scale. No corrosive action has been encountered on rinsed parts in the plant or in service after two years of use.

► **Auxiliary Floors**—Auxiliary decks in the C-124A are fabricated from .032 Dow FS1-H24 large corrugation sheet, and a study is underway to boost this to $\frac{1}{16}$ or $\frac{1}{8}$ in. This material is cold-formed to $\frac{1}{4}$-in. bend radius.



WEIGHT-SAVING magnesium castings include leading edge section (top), and parts of ailerons (center and bottom).

Some difficulty in manufacture has been experienced because of surface condition of the sheet, and a somewhat high notch sensitivity requires special care to prevent scratches in handling, Black reports. Service experience with the auxiliary floors has been good.

► **Bracket Uses**—In the Globemaster's control surface hinge supports and loading elevator door hinges, Dow 01 aged press forgings are used. Forgings also have been used for all cowl-flap hinge brackets. These and the extruded trailing edges have a good two-year service record on the plane (seven years on the predecessor C-74).

Magnesium sand castings comprise 95% of control system pulley and bellcrank brackets, but the material is not used where it would be subject to wear that would remove protective finish. Also, the material is not very practical for staking; hence some other method, such as snap rings, is suggested for bearing retention. Spherical staking is permissible, Black reports, but it is not recommended.

► **Discontinued Items**—Service with magnesium in the C-124's water-alcohol tank has not been satisfactory and has been discontinued. Hot-formed magnesium sheet was joined to magnesium castings by welding. The protective coating didn't adhere to the metal and vibration caused fractures along the edge attachment of castings to the sheet.

There were several instances, says Black, where magnesium forgings were used for hinges on auxiliary exit and main landing gear doors. But these were changed to aluminum forgings when high deflections were encountered. The magnesium parts had adequate strength but gave excessive deflection.

Attachment of magnesium components is with 56S aluminum rivets, steel bolts and Huck Lockbolts. With the latter two units, either the hole or the fastener is primed before installation, Black reports. In some cases the fastener is installed with wet primer. Edge distance, he says, is about three times the fastener diameter, in general. Normal Lockbolt installations with interference fits up to .007 in. have been satisfactory in ZK-60A extrusions.

► **Thin-Walled Castings**—Examples of large, thin-walled magnesium sand castings were cited by R. H. Osbrink of the R. H. Osbrink Mfg. Co., Los Angeles. Illustrating the savings possible with a cast unit versus a built-up component, Osbrink mentioned an experimental casting of a large duct—28½ in. long, 19 in. wide and 13¼ in. high. This unit involved $22,500 for production pattern equipment and the piece itself cost $750. Compared to this, fabrication tooling for the part would come to $131,300 and the part would

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cost $1,733. Another unit developed for prototype production is an intake duct lip, 40½ in. long, 19½ in. wide, with a skin line joggle of ¼ in.

► **Missile Applications**—Guided missile parts being cast by Osbrink include a booster-stage fin 32½ in. long and 23 in. wide, with internal rib and airfoil wall thickness varying from ¼ to ⅛ in. All fillet radii are .03 in. Weight is 13 lb., of which a large portion is concentrated at the point where the part joins the hub.

Another cast magnesium missile part is a tailcone 30 in. long with a diameter of 13½ in. Wall thickness varies from 1 in. down to ¼ in. Incorporated are internal and external bosses and mounting brackets as integral parts of the unit. Weight is 42 lb.; cost is $180, apparently a lot less than the expense of a comparable fabricated part.

An oversized T-section magnesium casting for a missile is known as the "breadboard." This is 42½ in. long, 11 in. wide, has a 7-in. stem. Wall thickness is ¼ in. Weight is 14½ lb. Installed, this unit is supported at one end only and successfully stands up under the cantilever bending.

► **Avionic Parts**—Osbrink is casting the parabola of an airborne radar screen to size, eliminating the expense of contour machining. This unit is 18¼ in. long, 14¼ in. wide, with a typical cross-section of ⅜ in. A second type under consideration is 45 in. long, 28 in. wide, with ⅜ in. wall and rib thickness.

Other thin-walled, highly accurate magnesium castings made by Osbrink are radar waveguides, varying from straight tubes to double gooseneck bends. All of these are cast with 100 microinch, or better, interior finish. One is a 90-deg.-bend unit weighing 1 lb. It is 11¼ in. long, 1¼ in. wide. Terminal ends are cast integrally. Previously this part was made up from extruded stock with terminals welded on—an arrangement reported to have resulted in 50% loss of the fabricated assemblies in production due to welding warpage.

A 4½-lb. antenna component, 18x15¼x10½ in., also embodies waveguide passages held to ±.004 in.

A waveguide passage also has been incorporated as part of an airfoil—a missile fin, weighing 5 lb. and including a heavy mounting boss on the bracket end. With a wall thickness of ⅜ in., passageway is held to ±.004 in.

► **Wing Parts**—Thin-wall wing components being cast in magnesium include a leading edge section and aileron parts. The leading edge casting is 22¾ in. long, 12½ in. wide, with a 5¼-in. maximum depth. Weight is 7½ lb. After edge is ¾ in. thick and has a skin line joggle of ¼ in. Thickness steps down to ⅜ in. at the nose section. Integral ribs, ⅜ in. thick, reinforce the section.

An aileron section cast by Osbrink has a wall thickness of ¼ in. It measures 21¼ by 12⅛ in. and is braced with integral ribs. A steel insert for a control tie is cast as a part of the unit.

Another part is the leading edge of an aileron for an advanced fighter. This unit tapers from a 5x6-in. dimension at one end to 1¾x3 in. at the other. Length is almost 7½ ft. The casting is hollow, has reinforcing ribs, and thickness steps from ⅜ to ⅛ in. aft. Recesses at three points provide for hinge attachment. Weight of the casting is only 10 lb.

A dive flap is cast in a 27x16½-in. section, ⅜-in. thick. Ribbing and large bosses are cast integrally. In the picture is another production dive flap—49½x33¾ in., with skin and rib thickness stepping down to ¼ in.

► **Small Castings**—Magnesium alloys are also in the investment casting (lost wax) picture. But according to Arwood Precision Casting Corp.'s chief metallurgist, Paul L. Butler, the demand for investment-cast magnesium parts has been small. This might be attributed to a situation where magnesium generally has not been specified for the relatively small parts produced by the process.

In addition to parts cast in steel and other metals, Arwood is producing magnesium alloy investment castings for engine applications such as fuel and lube system components (parts requiring pressure tightness); for avionic use, such as waveguides in various configurations; instrument control knobs; and various transport plane interior fittings.

Largest investment casting produced by Arwood in magnesium measures 1 × 5 × 3 in. This weighs about 1¼ lb. and is for a jet fuel system. Smallest part cast (not for aircraft application) weighs about 9/100 gram.

Engineering Shools To Graduate 3,000

An estimated 93,000 engineers will be graduated and available to the aviation industry during the next four years, according to figures leased by the U.S. Office of Education.

These estimates, recently published in the newsletter of the Engineering Manpower Commission, Engineers Joint Council, are based on enrollments for the fall term of 1952. Attrition rates accumulated over a number of years have been used to estimate final graduate totals. Figures do not take into account reserve groups, inductions.

Here's a year-by-year breakdown:

- 1953—23,000 engineering graduates.
- 1954—19,000 graduates.
- 1955—22,000 graduates.
- 1956—29,000 graduates.

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cost $1,733. Another unit developed for prototype production is an intake duct lip, 40½ in. long, 19½ in. wide, with a skin line joggle of ⅛ in.

► **Missile Applications**—Guided missile parts being cast by Osbrink include a booster-stage fin 32½ in. long and 23 in. wide, with internal rib and airfoil wall thickness varying from ¼ to ⅛ in. All fillet radii are .03 in. Weight is 13 lb., of which a large portion is concentrated at the point where the part joins the hub.

Another cast magnesium missile part is a tailcone 30 in. long with a diameter of 13½ in. Wall thickness varies from 1 in. down to ¼ in. Incorporated are internal and external bosses and mounting brackets as integral parts of the unit. Weight is 42 lb.; cost is $180, apparently a lot less than the expense of a comparable fabricated part.

An oversized T-section magnesium casting for a missile is known as the "breadboard." This is 42½ in. long, 11 in. wide, has a 7-in. stem. Wall thickness is ¼ in. Weight is 14½ lb. Installed, this unit is supported at one end only and successfully stands up under the cantilever bending.

► **Avionic Parts**—Osbrink is casting the parabola of an airborne radar screen to size, eliminating the expense of contour machining. This unit is 18½ in. long, 14½ in. wide, with a typical cross-section of ⅜ in. A second type under consideration is 45 in. long, 28 in. wide, with ⅜ in. wall and rib thickness.

Other thin-walled, highly accurate magnesium castings made by Osbrink are radar waveguides, varying from straight tubes to double gooseneck bends. All of these are cast with 100 microinch, or better, interior finish. One is a 90-deg.-bend unit weighing 1 lb. It is 11¼ in. long, 1¼ in. wide. Terminal ends are cast integrally. Previously this part was made up from extruded stock with terminals welded on—an arrangement reported to have resulted in 50% loss of the fabricated assemblies in production due to welding warpage.

A 4½-lb. antenna component, 18x15¼x10¼ in., also embodies waveguide passages held to ±.004 in.

A waveguide passage also has been incorporated as part of an airfoil—a missile fin, weighing 5 lb. and including a heavy mounting boss on the bracket end. With a wall thickness of ⅜ in., passageway is held to ±.004 in.

► **Wing Parts**—Thin-wall wing components being cast in magnesium include a leading edge section and aileron parts. The leading edge casting is 22¾ in. long, 12½ in. wide, with a 5½-in. maximum depth. Weight is 7½ lb. After edge is ½ in. thick and has a skin line joggle of ⅛ in. Thickness steps down to ⅜ in. at the nose section. Integral ribs, ⅜ in. thick, reinforce the section.

An aileron section cast by Osbrink has a wall thickness of ⅛ in. It measures 21¼ by 12⅛ in. and is braced with integral ribs. A steel insert for a control tie is cast as a part of the unit.

Another part is the leading edge of an aileron for an advanced fighter. This unit tapers from a 5x6-in. dimension at one end to 1¾x3 in. at the other. Length is almost 7½ ft. The casting is hollow, has reinforcing ribs, and thickness steps from ⅜ to ⅛ in. aft. Recesses at three points provide for hinge attachment. Weight of the casting is only 10 lb.

A dive flap is cast in a 27x16¾-in. section, ⅜-in. thick. Ribbing and large bosses are cast integrally. In the picture is another production dive flap—49½x33½ in., with skin and rib thickness stepping down to ⅛ in.

► **Small Castings**—Magnesium alloys are also in the investment casting (lost wax) picture. But according to Arwood Precision Casting Corp.'s chief metallurgist, Paul L. Butler, the demand for investment-cast magnesium parts has been small. This might be attributed to a situation where magnesium generally has not been specified for the relatively small parts produced by the process.

In addition to parts cast in steel and other metals, Arwood is producing magnesium alloy investment castings for engine applications such as fuel and lube system components (parts requiring pressure tightness); for avionic use, such as waveguides in various configurations; instrument control knobs; and various transport plane interior fittings.

Largest investment casting produced by Arwood in magnesium measures 1 × 5 × 3 in. This weighs about 1¼ lb. and is for a jet fuel system. Smallest part cast (not for aircraft application) weighs about 9/100 gram.

Engineering Schools To Graduate 93,000

An estimated 93,000 engineers will be graduated and available to the aviation industry during the next four years, according to figures released by the U. S. Office of Education.

These estimates, recently published in the newsletter of the Engineering Manpower Commission, Engineers Joint Council, are based on enrollments for the fall term of 1952. Attrition rates accumulated over a number of years have been used to estimate final graduate totals. Figures do not take into account reserve call-ups, inductions.

Here's a year-by-year breakdown:

- **1953—23,000 engineering graduates.**
- **1954—19,000 graduates.**
- **1955—22,000 graduates.**
- **1956—29,000 graduates.**

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EQUIPMENT

Combat Tire Report From Korea

Number of failures is low, but jet operations from pierced steel planks cause considerable damage.

By R. P. (Pepper) Martin

Tokyo—Reports from Korea indicate that tires of U. S. aircraft are standing up well in combat. Officers of the Far East Air Logistic Force believe tire quality has improved considerably in the last few years—"they are much, much better," says Lt. Col. Robert A. Bremer, director of maintenance at FEALF headquarters.

In a recent three-month period, FEALF has received only nine Unsatisfactory Reports (URs) on tires and five on tubes. They are all from fighter wings. URs are submitted only if Maintenance believes the manufacturer is at fault; equipment failure because of normal wear and tear is not reported.

▶ **Types of Failure**—The nine tire failures fell into these groups:

- Bubble formed between tread and cord—Six.
- Wire worked out of bead—One.
- Cracks developed in casing between tread and cord—One.
- Blowout, for no visible reason—One. (This was interpreted in the field as due to faulty manufacture, although FEALF points out that the tire might have been damaged by a faulty landing on the previous mission.)

None of the tires with bubbles blew out. The reason given is that when bubbles are formed by centrifugal forces built up in takeoff, pilots are usually unable to retract gear fully. When this occurs they use manual over-ride to get wheels up and housing closed. But with this warning of trouble, they try to make their landings as near-perfect as possible. This care in landing is believed to have prevented blowouts.

▶ **Why Failure?**—Officials believe that fighter pilots here ruin more tires by poor landings than they do elsewhere. They lay it to combat psychology. A pilot who has been chasing a MiG or who has been under fire is still living the battle when he gets back. He puts his plane on the ground in a hurry.

He may be over-fatigued, or misjudge his landing, and must apply his brakes hard. Or if his gauges show him low on fuel, he won't waste time on his approach. He'd rather ruin a tire than run out of fuel.

Furthermore, the jets operate from pierced-steel runways, because their frequent shifts to meet ground combat conditions preclude the possibility of constructing permanent, hard-surface runways wherever they go. The Air Force carries on a continuous process of renovating and patching the steel plankings, but it never quite keeps pace with deterioration. Mat locks pull loose, or the mat edges curl. Sharp points or curls may easily ruin a tire.

To make matters more difficult, combat aircraft such as the F-80s, F-84s and F-86s, carry loads "that nobody would have dreamed possible a few years ago," as Col. Bremer points out.

The Far East Air Force has a continuous indoctrination program for the pilots to make them "tire-conscious." Pre-flight inspection is rigid. In this theater, borderline wear or damage to a tire produces immediate rejection, whereas the same tire might be okayed for continued service in the U. S.

Col. Bremer and Maj. Frederick A. Carr, chief of the Unsatisfactory Reports Division, Directorate of Maintenance, HQ FEALF, caution that URs from the field may be misleading. Since FEALF has no laboratory facilities, the reports represent only the informed opinion of maintenance men. For that reason, names of manufacturers involved are omitted from this account.

▶ **Bombers & Transports**—There have been no URs from bombardment or cargo transport wings in the last few months. Carr and Bremer point out that these wings generally operate from better runways than fighters do, and tire failures are almost invariably attributed to wear and tear.

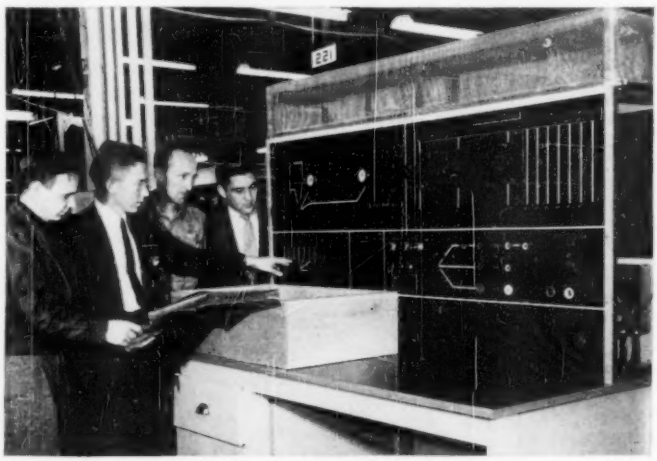
Despite "occasional epidemics of failures," FEALF has not had "any continual trouble" with tires, Bremer and Carr say. For instance, about six months ago it was discovered that beads on C-46 tires were too loose. But this "epidemic," like others, quickly cleared up.

FEALF is not completely happy about the report situation. Because of the paperwork involved, none of the flying units are submitting 100% reports. But if one specific make of tire were suddenly found faulty, telegram URs would be forwarded to FEALF, and quick checking with other units would be able to establish the trend to determine whether a faulty lot had been received or if factory inspection had been delinquent.

Thus far there has been no need for such an investigation.

▶ **General**—Other points made by Bremer and Carr:

- Trouble is anticipated with C-124 tires because they are occasionally deflated to reduce the impact pressure on runways in Korea.
- Several combat units which arrived in the theater with 10-ply tires have switched to 12-ply because of the additional safety factor.



BOEING TESTS INVERTERS

Believed to be the first of its kind, this new bench tests aircraft inverters before their installation in airplanes by the Boeing Airplane Co. at Seattle. Units are run up to full load within one minute, making rapid testing possible. The new bench was designed by Henry Osman (second from left) of the Boeing engineering department.

Scintilla Strong in Canadian Market

Bendix-Scintilla has a virtual analyzer monopoly in Canada, according to the Sidney, N. Y., manufacturer. The only other analyzers in the area are BTH (British Thomson-Houston) units currently used by Trans-Canada Air Lines, Scintilla states. But TCA has ordered Scintilla instruments for its eight forthcoming Super Constellations, the maker adds.

Scintilla lists these other Canadian users of its ignition analyzers:

- **Royal Canadian Air Force,** which has adopted the unit as standard throughout its service, says Scintilla.
- **Royal Canadian Navy,** which also has standardized on the instrument. Navy's procurement program is just starting, according to Scintilla.
- **Hollinger-Ungava Transport, Ltd.,** which will install the unit in its copters.
- **Electric Auto-Lite, Ltd.,** uses the Scintilla to time its automotive distributor.

Responsibility for all these sales is credited to Scintilla's Canadian representative, Aviation Electric Co., of Montreal.

OFF THE LINE

A half-million-dollar, mechanized engine overhaul shop to be built at San Francisco Airport by Pan American World Airways, will perform all major engine overhauls for Pan Am's entire Pacific Alaska division fleet (now being done by Pacific Airmotive Co. at Burbank), in line with the airline's long-established policy of doing its own overhaul work whenever possible. Engines to go through the shop: Boeing R4360s, DC-6B R2800s and DC-4 R2000s. The facility will begin operation in a year and will be in full swing three months later, according to PAA.

Noise from Constellation wing flap drive motor has been substantially cut by shockmounting the motor and using flexible hose to hook it into the hydraulic system.

A. E. Ulmann & Associates, a New York export and consultant engineering firm, has been appointed purchasing agents for British European Airways. The company has been acting in a similar capacity for the Italian airline, Alitalia, for the last two years.

A horizontal stabilizer actuator, capable of withstanding end-loads up to 16,000 lb., is being manufactured by Air Associates, Teterboro, for the Glenn L. Martin-built twin-jet Canberra bomber. The unit, labeled M-4860, features a low-pressure, multi-disk clutch, shock-absorbing ring springs and a position-indicating selsyn transmitter geared to the actuating screw, according to Air Associates.

Ignition Harness Test Simplified for EAL

An investment of less than $100 in some test equipment has saved Eastern Air Lines thousands of dollars annually, the carrier says.

The equipment is a special ohmmeter for checking out low-tension ignition harness. Reading as low as .0002 ohms, it has cut overhaul time for each harness from eight hours to two hours, and reduced material waste. It was designed and built for Eastern by Petruff Radio Sales and Service Co., Miami.

The meter is so sensitive it can detect a single broken strand or a poor solder joint in an ignition harness with 40 conductors of seven strands each, EAL claims. The tester not only indicates flaws but pinpoints them, making it possible to replace only defective parts instead of the entire assembly. Before, Eastern found it necessary to disassemble each harness and replace all wiring.

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FINANCIAL

The Bankers Look at Air Financing

- **IBA report tells why carriers, despite huge capital expansion, need little aid from investment bankers.**
- **Study also expects copters to benefit if noise from jet transports forces airports farther from town.**

While aviation industries have been enjoying a steadily increasing volume of business, they have required a minimum of capital financing from investment bankers.

This is one of the important points made in the special report presented to the recent convention of the Investment Bankers Assn. by its Aviation Securities Committee. The report of the committee, which was under the chairmanship of Hugh Knowlton of Kuhn, Loeb & Co., appears to have more substance than similar reports prepared for past conventions.

Air Transport

The airlines are pictured in a period of increasing gross revenue while also vastly expanding their capital assets. Purchase of flight equipment is primarily responsible for the huge level of capital expenditures projected to reach the estimate of more than $750 million by the middle of 1954.

But the curious anomaly remains that this large measure of capital expenditures is being financed, for the most part, outside of normal investment banking channels. The basis for this situation is succinctly noted in the IBA Aviation Securities Committee report.

▶ **Fast Depreciation**—The managements of the airlines have considered it prudent to depreciate their flight equipment over periods ranging from four to seven years, shorter by far than the depreciable life of the capital assets of other businesses. This has resulted in larger annual charges for depreciation than if this equipment were depreciated over a long period of time. To date such annual depreciation charges have been allowed by the government for income tax purposes, thus lessening the tax burden and increasing the amount of available cash throw-off.

The airline business has been fortunate enough in recent years to generate sufficient cash funds to meet such depreciation charges. Therefore, the annual depreciation charges of the airline industry have made such an important contribution to new capital needs as to make it possible for the airlines to finance these needs either out of internally generated funds or such funds supplemented by bank borrowings.

The report further notes that from the end of 1949 to the end of 1951, during a period of great expansion in the airline industry, the long-term debt of the domestic airlines decreased. This debt was reduced from $148 million to $134 million.

So long as the new capital requirements of the airline industry are primarily for flight equipment and so long as it is prudent and possible for airlines to depreciate this equipment in a relatively short period due to the inroads of obsolescence, the soundest way for airlines to meet new capital require-

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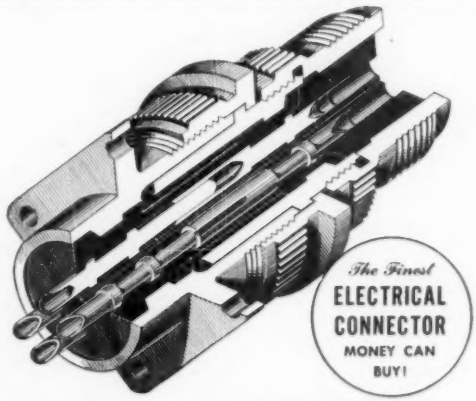

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ments which cannot be provided out of cash earnings, is by the issuance of common stock or by short-term debt obligations maturing concurrently with the depreciation of the financed equipment.

The reason for the failure of more equity airline financing to materialize is attributed to the disappointing market experience of stocks of this group during 1952, thus creating a market climate unfavorable for financing capital requirements by means of new stock issues.

The disfavor prevailing toward airline stocks is blamed on the decline in airline earnings during 1951. Special non-recurring causes such as the closing of the Newark Airport resulting from the three accidents in Elizabeth, N. J., and the curtailed operations resulting from a period of gasoline rationing caused by the oil strike, contributed to the decline.

▶ **Narrowed Profit Margins**—But the narrowing profit margins are held chiefly responsible for the industry's current condition.

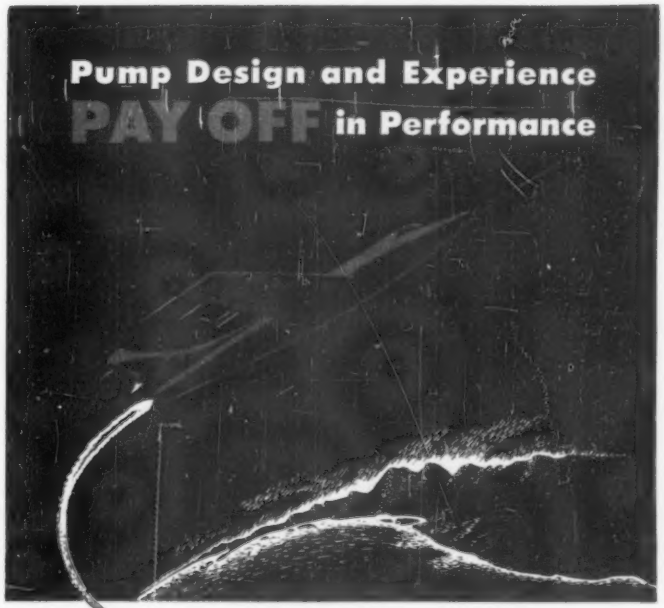
The report observes:

"Rates have declined in the face of mounting costs for materials and labor and heavier tax burdens. This is not the first time that the industry has presented the anomaly of lowering rates in spite of the increasing demand for seats and other space. The airline industry seems to be unique in its habit of cheapening the price of its product when the demand is great and attempting to increase its price when the demand has fallen off. The present tendency toward lower rates is due partly to pressure from the CAB and perhaps more importantly to the development of coach service with its lower fares.

It is probably still too early to say categorically whether the tremendous growth of coach travel is a healthy thing for the airlines. It is true that it has stimulated the demand for the airline's product, but at what cost? The answer will be clearer in the next year or two. Meanwhile, the fact remains that unless the decline in profit margins can be erased the airlines will be facing a period of profitless prosperity."

▶ **Rate Review Asked**—The committee suggests a ". . . complete review on a high governmental level of the rate policies of the airline industry, including not only passenger rates but express, cargo, and mail as well. In the matter of mail rates, the year 1952 has seen a reduction in these by the CAB which, of course, has had its effect on airline earnings.

"The primary function of mail rates is to act as a sort of governor on earnings, geared to allow the lines to earn a reasonable return on their invested capital. To reduce them in the face of



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a declining earnings trend such as was done earlier this year does not seem to be consistent with the concept under which the airlines receive mail pay."

► **In the Crystal Ball**—A more hopeful view of the airline outlook is projected for when the present equipment program is completed, by mid-1954. It is felt that the benefits of modern equipment will serve to bring about an increase in net profits, provided the traffic demand keeps pace with increased productivity of the new aircraft. This will be influenced by two things:

- **The general level of business.**
- **The ability of the airlines** to please the traveling public with the services they offer in competition with other forms of transportation.

The report observes: "The airline industry can be said to have come of age, but now that it is a full-fledged adult it must be ever vigilant against a deterioration in the quality of its service. By this is meant not only speed and safety in the air but all the collateral elements involved in the transportation of passengers."

The importance of maintaining an increasing demand for airline services is clearly noted in the face of the substantial increase in the industry's capacities.

Two encouraging developments have been noted through the progress of mergers and equipment interchange proposals.

► **Jet Transports**—Significant observations are advanced as to the potential of jet transport. The report notes:

"In spite of all the publicity given to the subject, it appears that even the de Havilland Mark III Comet, the most advanced jet transport on the horizon, will not be economical to operate and it does not seem probable that a jet transport, suitable for operation by our domestic airlines, will be in service for at least six years.

"In addition to the fact that the present-day jet is prohibitively expensive to operate, there are technical obstacles in the way of incorporating it into service on the highly congested routes of this country. In addition, the noise made by jets operating in any substantial numbers in and out of thickly inhabited communities would be so appalling as to be unendurable. As it is only a question of time before jets have developed to a point where they will be an important factor in commercial air transportation, it is not improbable that because of the noise nuisance the main commercial airports will eventually be removed to points way outside of metropolitan areas.

"As a result of this development one can see another important role to be played by the helicopter in carrying passengers from the center of cities to these relatively distant airports."

Airfreight

While it is noted that the airfreight business is surrounded with an optimistic hope and has grown, ". . . it has not overcome its basic limitations arising from the fact that the plane has not yet been built which can carry goods through the air cheaply enough to compete with other forms of transportation. . . ."

Manufacturing

A more favorable view is generally accorded the aircraft manufacturing industry. Prospects for increasingly high volume are reported good for at least three years. On the question of profit margins the report says:

". . . **When the net margin has reached a point between 1½% and 2% of sales, as is the case today, it cannot be expected to go any lower. It is believed that the industry has already absorbed the greater part of the cost impact attendant upon large scale expansion and while further increases in wages may have to be faced, the industry's principal customer, the government, will have to bear the brunt of these under the escalator clauses in its contracts.**"

While propects for the aircraft manufacturers are expected to show steady improvement, this development is not expected to be paralleled by the likelihood of public financing in the same measure. Self-liquidating bank borrowings made possible through V-loans guaranteed by the military services have taken the brunt of the industry's financial requirements.

The technical accomplishments of the aircraft group are accorded recognition and provide the basis for the conclusion that when our ". . . airline industry takes to the air with jets it will be with planes of American manufacture."

—Selig Altschul

"I'm telling you—the cabin compressor just ran wild."

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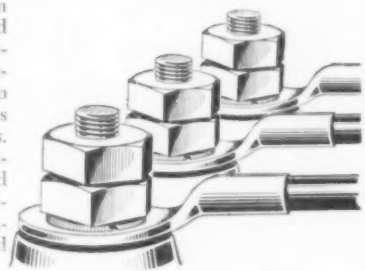
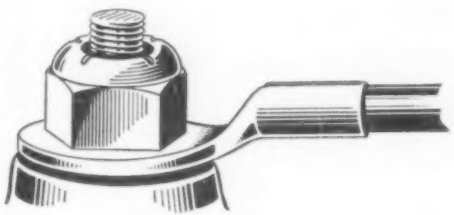
Fastener Problem of the Month

VIBRATION-PROOF ELECTRIC TERMINALS — DECEMBER, 1952

PROBLEM: Severe vibration acting upon standard nuts used on electric terminals too frequently results in loose connections. Double nuts are difficult to adjust correctly and lock washers can tear soft brass connections. Yet the increasing use of electrically powered components and increasing power loads make secure terminal fastenings imperative on modern military and commercial aircraft.



SOLUTION: Positive protection against the loosening effects of vibration is provided by self-locking *brass* Elastic Stop Nuts. The red elastic locking collar provides a constant and positive grip on terminal studs . . . makes continuous performance more certain by preventing ignition or power supply failures. Because Elastic Stop Nuts lock in any position on the stud, whether firmly seated or not, they are easily adjusted. They are readily removed and can be re-used.



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Please send me the following free fastening information:

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- ☐ Here is a drawing of our product. What fastener do you suggest?
- ☐ AN-ESNA Conversion Chart

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NEW AVIATION PRODUCTS

Low-Cost VHF Set

A new low-cost aircraft radio for corporation and private planes approaches the reception and transmission of an airliner set. It will be marketed early in the new year by National Aeronautical Corp., Ambler, Pa.

The new Simplexer Model VC-12 is a VHF radio with wide-band reception and transmission possible on 12 crystal channels from 118 to 127 mc. Low-cost VHF radio generally permits transmission on only two or three crystal-controlled channels over a narrow band width of about two megacycles.

The manufacturer notes that commercial airliner radios carry many more channels than the Simplexer, but it calls the 3-lb. set a large step forward in the low-cost radio field.

Narco says the Simplexer will enable private pilots to take advantage of the recent FCC ruling allowing them two-way, single-channel communication on air traffic control tower frequencies between 118.1 and 121.3 mc. The operation is expected to clear the crowded 112.5 tower-calling frequency. The set also permits simplex communication on the general range station-calling frequency of 126.7.

The new set is of standard glove compartment panel size.

Narco says the de luxe crystal kits approach airline radio operation and, when combined with an Omnigator VHF navigator-communication set, operates on 20 transmitter channels.

Stripped down for pleasure aircraft, the Simplexer costs no more than its simpler predecessors, Narco says.

Silicone Cost Cut

A process enabling silicone parts to be produced in the same molds as those used for natural and synthetic rubber has been developed by Minnesota Silicone Rubber Co.

By avoiding the need of making special silicone molds, several hundred dollars per mold is saved, the company claims. Engineers of the firm say they

can take any Dow Corning or General Electric silastic stock and produce silicone parts from the molds that have been used by their affiliate, Minnesota Rubber & Gasket Co., or by any other rubber molder. This is beneficial particularly where short runs are involved, they point out.

Special molds for silicone rubber parts previously were needed because shrinkage factors differed from other materials. With the new process, the shrinkage factor with silicone parts is being held to 1½% after 24 hr. at 480F heat-treating temperature, the company says.

Minnesota Silicone Rubber Co., Minneapolis 16, Minn.

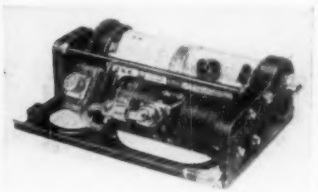
Instrument Welder

A new portable spotwelder allows production-line efficiency and speed in making confined and difficult instrument welds, according to the manufacturer, Unitex Corp.

The maker says the "tweezer-type" spotwelder, Unimatic Model 1012, will give uniform beads on materials and thicknesses ranging from .0005-in.-diameter copper and nichrome wires to a pair of .018-in. sheets of Type 302 stainless steel. An electrode-switch assembly provides automatic control of welding pressure.

The spotwelder weighs 17 lb. and draws 300 watts.

Unitex Corp., 275 N. Halstead Ave., Pasadena 8, Calif.



Bombsight Defroster

A dry air system to prevent frosting or fogging of the dome lens of vertical periscopic bombsights in military aircraft has been developed by Lear-Romec.

The 7.4-lb. dehumidifier sucks air

AIRCRAFT ENGINE BUILDERS LOOK TO

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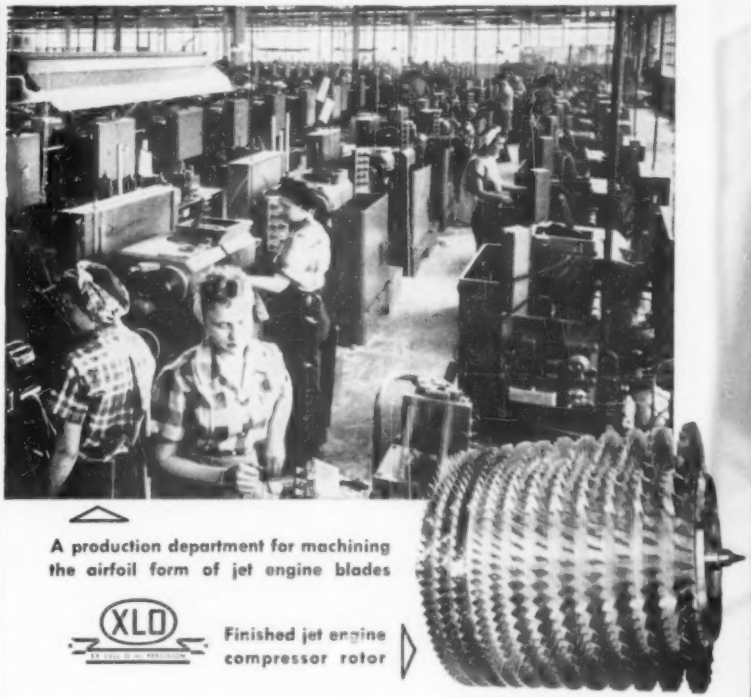

A production department for machining the airfoil form of jet engine blades

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A complete line of automatic blade finishing machines, designed and perfected at Ex-Cell-O, turns out large volumes of jet blades to the specifications of engine builders. In addition, Ex-Cell-O, through its subsidiary, Robbins Engineering Company, machines rotor wheels, inserts the blades, and assembles the complete rotors.

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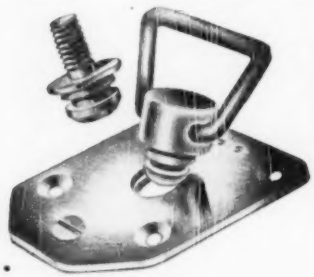

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subsidiary of UNITED-CARR FASTENER CORP.

through a pump, forces it through a dessicant jar, and returns dry air to the bombsight lens. The Lear Romec Type B-1A dessicator is a closed-circuit system, with the exception of a breather to replace air loss.

Romec is supplying the dessicator to the mechanical division of General Mills, Inc., for use with bombsights produced for B-47 Stratojet bombers.

The air pump motor is rated at 1/50 hp. at 27 v. d.c., 1.5 amp. The manufacturer describes it as a continuous-duty, explosion-proof type, with a brush life of 500 hr. at 40,000 ft.

Lear, Inc., Romec division, Elyria, Ohio.

Improved Gas Filter

A new refueling truck filter rig cleans 99% of all particles larger than 5 microns from aviation gasoline, according to the manufacturer. It has resin-impregnated filter elements and is available in models from 15 gpm. capacity up. The filter can be installed on refueling trucks either vertically or horizontally.

Purolator Products, Inc., Rahway, N. J.

ALSO ON THE MARKET

New plastic cable clamps save weight but are strong enough to take on the jobs of conventional clamps according to the manufacturer. Made of Saran thermoplastic, the clamps are said to resist fungus and other environmental conditions encountered in military applications. Holub Industries, Inc., Sycamore, Ill.

Hand files made to very close tolerances are designed to permit precision finishing. They are thinner and more flexible than usual. The manufacturer describes his product in use as "more like a hand broach" than a file. Tacony File & Hardware Co., Philadelphia.

Better quality control may result with use of surface plates made of heavy, precision-finished black granite. They permit precise measurements, have a guaranteed surface accuracy of .00005 in. Lawley Granite Surface Plate Co., 1412 Packard Bldg., Philadelphia.

Portable television for industrial use has self-contained closed circuit and can be used with standard television receiver. Kit can be utilized for wide variety of jobs. Typical examples are dangerous inspection tasks, operations hard to see, and multiple viewing. Dage Electronics Corp., Beech Grove, Ind.

A New, Record-Breaking Network

When Korea happened, the already heavy demands on Eclipse-Pioneer's services multiplied overnight . . . and also became tremendously more complex than ever before. A key step in coping with this new responsibility was the creation of a vast network of sub-contractors—a network that was inaugurated a short three months after the start of Korea and has since grown to include 23 complete unit sub-contractors and over 2300 first tier parts sub-contractors. This network, coupled with our own greatly enlarged facilities, represents a 2½ times faster rate of expansion than that of the comparable pre-Pearl Harbor defense build-up period, and has made possible an acceleration of Eclipse-Pioneer production output to a record 514% of our pre-Korea level. Despite these records, we are continuing to increase the tempo of our overall program—and will continue to do so until we catch up fully with our unprecedented demand.

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LITTLE SILVER FLEET of Aerovias Nacionales Del Agro Cessna 170s and 190s throng the apron at the carrier's home base, Guayaquil, Ecuador. The tiny single-engine craft have successfully taken on daily scheduled airline service and handled the job without accident.

South American Airlines Use Lightplanes

- **Some equal DC-3 speed; allow easy maintenance.**
- **Plane market upped by pilot training programs.**

By Alexander McSurely

ONE OF TWO Cessna 170s operated by British Colonial Airlines, British Honduras, in its trim paint job. Good small-field performance has spurred 170's use.

Wichita—More than 100 Cessna all-metal four-place 170s and five-place 190s are in scheduled airline and non-scheduled air-taxi service in South America, Gene Charlton, Cessna export sales manager, told AVIATION WEEK.

The small single-engine planes furnish public transportation in areas where airstrips and traffic density will not permit use of larger equipment, Charlton says, and already have proved a valuable means of augmenting the primitive ground transportation facilities in many areas.

► **Smallplane Market**—Charlton foresees a steady and growing smallplane market in South America as additional airline and air-taxi services begin using the lighter planes in regions where other transportation still is primitive.

He says the simplicity of high-wing, all-metal aircraft with fixed spring-steel landing gear lends itself to simpler maintenance operations for small companies. Charlton also points out that the 165-mph. cruising speed of the Cessna 195 is comparable to DC-3 operational speed. While the 170 cruising speed is about 120 mph., this still is several times faster than the speeds of surface transportation over much of the terrain which the planes cover, Charlton says.

► **No Accidents**—Most active all-Cessna-equipped airline operation is Aerovias Nacionales Del Agro (ANDA) based at Guayaquil, Ecuador. The airline runs a fleet of 12 Cessnas, nine 170s and three 190s, in regular daily schedules to eight cities in Ecuador and one in Peru.

ANDA has operated for more than three years without an accident, Charlton reports. In this time, it has hauled approximately 32,000 passengers over segments of the 320-mile air route extending from Tumbes, Peru, on the Peru-Ecuador border, to Esmeraldas, northernmost city and seaport of Ecuador.

Aerovias Nacionales De Colombia (Avianca), a Pan American World Airways affiliate in Columbia with headquarters at Bogota, recently took delivery on its twelfth Cessna 195. The aircraft is the highest-powered version of the 190 series with a Jacobs 300 hp. radial engine and 165-mph. cruising speed. Avianca also has a Cessna 170.

The airline normally operates in the Llano plains section of Colombia and also flies into Medellin and Barranquilla, Colombia.

Although the 195s are designed as five-place craft, they sometimes carry as many as five passengers plus pilot in the Colombia operations. The Avianca 170—despite its small 145 hp. Continental engine and four-place design—recently carried four passengers plus pilot on a semi-bush pilot high-altitude operation over the Colombian mountain area.

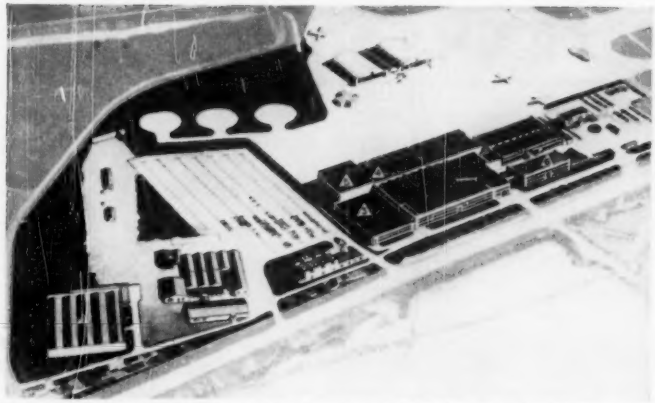
British Colonial Airlines, operating with its main base at Belize, British Honduras, operates two Cessna 170 planes from Belize to Stann Creek and Punta Gorda in Honduras and also to Cetumal, Mexico.

Charlton says his distributors report there are more than 15 air-taxi companies in Brazil. One operates nine Cessna 170s and the others, operate three 170s or more. Some of the companies fly deep into the interior of Brazil.

Additional air-taxi companies are being set up or are in operation in Argentina and Chile with four-place 170 equipment.

Details on the extent of these operations are not available yet.

► **Training Program**—Another facet of the Cessna program in South America not directly connected with air transport is standardization—the two-place Cessna 140 and the four-place 170 as the training airplanes for government-sponsored aero clubs.



UAL OVERHAUL FACILITIES at San Francisco will look like this when they are completed in 1954. Shown are: 1. warehouse, 2. carburetor shop extension, 3. engine shop extension, 4. DC-6 and Convair-Liner overhaul hangar, 5. DC-7 and jet airliner overhaul hangar, and 6. two-story office building and sheet metal shop.

UAL Expands Maintenance Base

United Air Lines will expand its San Francisco maintenance base by 1954 to handle overhaul of 27 planes a month —three DC-7s, 12 DC-6s and 12 DC-6Bs, the company says. It now overhauls 23 a month there, but almost half these are DC-3s.

The high degree of mechanization planned for the new facilities will result in employment at the base expanding by only 300—to a total of about 2,800 by 1954—while the amount of work capacity about doubles.

President W. A. Patterson says main steps in the expansion will be "enlarging the present engine and carburetor shops; construction of two more overhaul hangars, one for DC-6s and Convairs, the other for DC-7s and future jet transports, and a two-story building for both additional office space and expansion of sheet-metal-and-welding operations. Several miles of paving and ramp area also will be laid."

This will add about 160,000 sq. ft. of shop, office and hangar space. A program begun last year and now reaching completion added 56,000 ft. of warehouse space.

The company refuses to reveal even an approximate cost estimate for the new expansion program, but unofficial sources place it at substantially more than $1 million.

Gorham Heads CAB Routes Division

Civil Aeronautics Board has promoted James E. Gorham to head its important Routes and Carrier Relations division. He succeeds Bernard Slebos, who recently resigned to join Pan American World Airways.

Gorham was chief of the "Special Studies" Section of CAB's Accounting and Statistics division, where he directed a major part of the Board's subsidy separation reports. Gorham has represented the board on inter-agency negotiations in claiming critical material for airlines under the Controlled Materials Plan. He also has participated in analyses and forecasts for airline route and mail rate cases at CAB.

▶ **Personally Popular**—Washington observers report that Gorham has a reputation for open-minded and careful treatment of all problems. His new appointment to head the Routes and Carrier Relations division generally met with hearty approval.

Gorham was graduated with a bachelor of arts degree from Columbia University in 1934. He immediately entered government service with the Federal Coordinator of Transportation in New York and was transferred to Washington with the government shortly thereafter. He came to CAB in 1947 from the Office of Price Administration. He is married and has three children.

▶ **Important Issues**—Some major problems confronting Gorham during the coming year include:

- **Colonial merger case.**
- **Pacific routes case.**
- **Regional carrier applications** asking CAB to relax many current route restrictions now that non-subsidized carriers are able to compete at their own, not taxpayers' expense.
- **Nonsked investigation.**
- **IATA affairs.** Agreements among the international airlines, through their cartel-type International Air Transport Assn., are subject to CAB approval or denial. Gorham's division treats a large proportion of the cases.

Delta-C&S Merger Expected Jan. 20

The merger of Delta Air Lines and Chicago & Southern Air Lines probably will become effective by Jan. 20, Washington observers believe.

It is understood Civil Aeronautics Board already may have approved the merger, subject to final signature of three CAB members after an opinion-writing division has prepared the merger order.

The case probably will go to President Truman for executive approval before he leaves office Jan. 20, because the merger involves transfer of the C&S international Caribbean routes.

Although CAB has not had a quorum (three members) on hand for two weeks, it is believed the three members who heard oral arguments earlier this month immediately instructed the opinion-writing division to prepare an approval of the merger. It would be subject to their signatures on the opinion when prepared and to presidential approval of the international route by Mr. Truman.

The CAB examiner recommended to the Board that only the international aspect of the opinion be submitted to the President. But it is believed the Board feels that the whole opinion should be handled in one piece and that the merger is sure to get the President's approval. The international phase is a minor adjunct to the domestic route system, over which CAB has control.

Eastern Air Lines asked the Board to prohibit Detroit-Miami through service by the merged company. Trans World Airlines wanted Detroit-Cincinnati service prohibited, and Pan American urged severance of the inactive New Orleans-San Juan route. A compromise decision is expected to be the answer.

Wiggins Wins CAB Renewal Hearing

Civil Aeronautics Board temporarily has reprieved the business life of Wiggins Airways, whose certificate would have expired by CAB order Dec. 31. The Board has decided to hear oral arguments for the reconsideration of the order at hearings requested in petitions submitted by Wiggins and New England civic groups.

CAB specified in its new order that the arguments will be held "before the

full board." A CAB spokesman said he interprets the order to mean the arguments cannot be held until presidential appointment and Senate approval of a fifth member of the Board.

Wiggins' fate probably hinges on that fifth member. The present four members split evenly on the Wiggins' renewal case. The two Republican members, Chan Gurney and Oswald Ryan, voted with former Chairman Donald Nyrop to end the Wiggins route experiment. Democrats Joseph Adams and Josh Lee dissented.

Adams, Gurney, Lee and Ryan all agreed to hear new arguments, but only on the petitions for reconsideration. Outlook is that Wiggins still is likely to go out of business after the hearings.

Wiggins' petition said a new, economic route proposal did not receive adequate consideration in the original oral argument. Also petitioning for reconsideration were Rutland, Vt.; the Vermont Aeronautics Commission; State of New Hampshire; Norwood, Mass.; State of Rhode Island; and the Greater Boston Chamber of Commerce.

The new Board action prevents Mohawk Airlines from implementing its Albany-Boston route extension and prevents Northeast Airlines from serving Pittsfield, Mass., as originally provided in CAB's denial Oct. 21 of Wiggins certificate renewal.

In the original Board order denying Wiggins' renewal request, Nyrop, Ryan and Gurney pointed to the extreme subsidy requirement and to New England's adequate surface transport system.

Adams and Lee said the Wiggins route had been uneconomic and that the new compromise route proposal should be tried, before CAB made a final decision.

TWA C&S to Fly New York-Houston

Civil Aeronautics Board has approved an interchange agreement between Trans World Airlines and Chicago & Southern Air Lines that provides a one-plane, New York-Houston service.

The flight will not compete with Eastern Air Lines monopoly on nonstop service between the two cities.

The new service is set up primarily to give Pittsburgh direct flights to Memphis and Houston.

Italy Tests New Delta

(McGraw-Hill World News)

Milan, Italy—Italy's new delta wing Ambrosini Sagittarius powered by the Marbore turbojet engine is being flight tested, according to the Defense Ministry. The plane previously has been tested successfully with an Alfa 115.

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DOMESTIC TRUNK AIRLINES

	Amount	% Change from 1951
Passenger revenue	$665 million	+17
Mail revenue	37	− 2
Express revenue	15	+ 5
Freight revenue	25	+21
Other revenue	15	0
Total oper. rev.	757	+15
Total oper. expense	663	+20
Net operating income	94	−10

NOTE: Estimates based on nine months financial data.
Net operating income excludes federal income taxes and non-operating income and expenses.

INTERNATIONAL AIRLINES

Passenger revenues*	$209 million	+13
U. S. mail revenues*	52	− 6
Foreign mail revenues*	10	+ 3
Cargo revenues*	27	+ 9
Excess baggage rev.*	4	+17
Nonscheduled revenues	4	+ 9
Total transport rev.	307	+ 9
Total oper. expenses	302	+13
Net operating revenue	5	−67

NOTE: Estimates based on nine months reporting in 1952.
Revenues exclude $3 million back mail-pay award April, 1948, to September, 1952, to Pan American. Revenues also exclude "incidental non-transport revenues."
**Scheduled operations only.*

Airline Profits Drop in 1952

ATA reports revenues up, but profits reduced by expansions, soaring labor and material costs.

Airline profits reported for 1952 will average less than 1951 record levels, although revenues are up 14% to almost $1.25 billion. Passenger revenue will gain another 10 to 15% in 1953, but it is too early to estimate industry profitability.

The profit predictions are highlighted in a year-end projection of airline revenue and expense by Dr. Lewis C. Sorrell, director of the Air Transport Assn.'s Economic Research Division.

Scheduled domestic trunk airlines' 1952 profits before income taxes will drop 10% below last year to $94 million. International lines' net before tax will drop 67% to about $5 million. Nonscheduled airlines' reported earnings will be off 44% to about $3 million, not including the earnings of agencies.

▶ **Costs Cause Profits Drop**—Domestic trunkline gross revenue gained 15% this year to $757 million, while expenses increased 20%. International revenues gained 9% while expenses went up 13%.

The cost-over-profit pattern may not be repeated in the coming year, if Dr. Sorrell's prediction of a 10 to 15% further revenue gain is correct. Some of the 1952 problems were non-recurrent in nature. These items include:

• **New equipment cost.** Huge new fleets were introduced to schedule service this year, with consequent high transition costs. Individual airlines will continue adding new equipment in 1953 perhaps with no more total impact than in the past year.

• **Operational knocks.** From the Newark Airport shutdown last winter through the aviation gas shortage last May, the airlines generally took hard knocks that hurt earnings seriously in the first half of the year.

• **Rising labor and materials cost** might not continue through 1953 as rampant as in 1952.

One factor that will continue to

Incomes of Irregular, Cargo and Local Service Carriers for 1952

IRREGULAR SERVICE CARRIERS	Amount	% Change from 1951
No. of passengers	718,184	+13
Rev. passenger miles	1.3 billion	+21
Cargo ton-miles	78 million	− 4
Total revenues	$85	+25
Total expenses	82	+31
Operating profit	3	−44

NOTE: Estimates based on % increase first nine months 1952 over same period 1951.

CERTIFICATED CARGO LINES		
Freight ton-miles	98 million	− 8
Operating revenues	$18	− 1
Operating expenses	17	+10
Operating profit	1	−61

NOTE: Estimates based on nine months' reports.

LOCAL SERVICE LINES		
Passenger revenues	$19 million	+16
Mail revenues	20	+13
Other revenues	1	+10
Total revenues	40	+14
Total expenses	41	+17
Operating loss	1	

NOTE: Estimates based on nine months traffic, six months' financial reports, with no account taken of retroactive mail pay awards of the second half, 1952.

affect many of the airlines' profit margins in the coming year is lower load factors due to the introduction of larger fleets. The 1951 loads were abnormally high.

► **1952 Summary**—The ATA estimate for overall U.S. air carrier revenues, including nonskeds, in 1952 is: passenger revenues $945 million, 17% more than a year ago; mail revenues $119 million, down 1%; cargo revenues $107 million, up 9%; total revenues $1,207 million, up 14%.

Passenger-miles of the domestic trunklines alone were 20% greater than railroad Pullman totals in 1952.

Airfreight volume of the certificated cargo carriers fell off about 8% although increased rates brought revenues almost equal to 1951. With costs up 10% and revenues down, profits were squeezed to slightly less than $1 million altogether.

These preliminary figures (see tables) prepared by Dr. Sorrell of ATA are based generally on the nine-month financial data of the 14 domestic trunklines, 11 international lines of the U.S. flag, 4 cargo, 18 local service, and about 60 nonscheduled lines. Territorial and Alaskan carriers are excluded from the list.

Morey Named Head Of North Central

North Central Airlines has appointed Howard A. Morey as president, replacing the late Donald A. Duff. Board chairman E. A. Mueller had served as acting president after Duff's death Nov. 14.

Morey was director and corporate vice president of North Central and also has been fixed-base aviation operator since 1925. He has been chairman of the Wisconsin Aeronautics Commission since its founding.

North Central, formerly called Wisconsin Central, has signed a merger agreement with Lake Central Airlines. CAB approval of this merger depends largely upon Morey's success in cutting costs, which have increased more than the industry average during the company's mushroom growth.

New Garuda Flight

(McGraw-Hill World News)

Melbourne—A regular air service to Japan is being planned by Garuda Indonesian Airways, but certain equipment and financial problems remain unsolved. Although some quarters advise purchase of U. S. aircraft, indications are the orders will be placed in Europe or England.

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Pilot Error Blamed In Comet Crash

By Nat McKitterick

(McGraw-Hill World News)

London—Ministry of Civil Aviation investigators reported officially last week that pilot error caused the crash of a British Overseas Airways Corp. jet Comet shortly after the airliner took off on Oct. 26 from Rome's Ciampino Airport (AVIATION WEEK Nov. 24, p. 17).

Air Commodore Sir Vernon Brown, chief MCA investigator, said Capt. R. E. H. Foote tried to get the Comet airborne while it was in an excessive nose-high attitude—partially stalling the four-jet airliner on takeoff.

The Comet, en route from Rome to Johannesburg, South Africa, overshot the runway after abandoning takeoff and crashed into two mounds of earth 10 yards short of the airport boundary. One of the 35 passengers aboard the Comet suffered slight injuries. The airliner was a total loss with exception of internal fittings, seats and instruments now being salvaged.

The crash was the first major accident involving a Comet. First reports erroneously blamed the crash on engine failure.

▶**Official Report**—Here is the MCA investigation findings:

"At an indicated airspeed of 112 knots (129 mph.), the captain lifted the aircraft . . . and when he considered a safe height had been reached, he called for undercarriage up. At the same instant, the port wing dropped rather violently, and the aircraft swung to the port.

"The controls gave normal response and lateral level was regained.

"At this point, the captain realized the aircraft's speed was not building up, although he made no reference to his airspeed indicator. A pronounced judder (a combination jar and shudder) was felt, which he associated with the onset of a stall. In spite of two corrective movements, the control column judder continued.

"Before the first officer had time to select undercarriage up, the aircraft came down on its main landing wheels and bounced. A decision to abandon the takeoff was made."

▶**Crash Damage**—Large quantities of fuel spilled out of the Comet's port wing integral tanks after a runway direction indicator tore off the tip of that wing and sheared off the pitot tube. The landing gear was wrenched from the fuselage in the crash against the earth mounds, and a steady strut on the starboard inner engine was sheared

JAP AIRLINE CREWS TRAIN IN U. S.

Grounded since V-J Day, the Japanese are taking initial steps toward getting back into the air. Here a group of 13 Japan Air Lines employes receive Link trainer instruction at Taloa Academy of Aeronautics, Oakland, Calif., under the guidance of Bert Elliott. A total of 13 pilots and 2 navigators are being trained. They will return to Japan in four to six months to take up their new duties with the international Japanese carrier. JAL recently took delivery on two former National Airlines' DC-4s costing $1.4 million. Sale was handled by William C. Wold Associates, N. Y. C.

loose—allowing the engine to rotate on its trunnions in a nose-down position. The nose wheel was forced up into its housing, and the tail bumper unit was torn from the rear part of the Comet fuselage. Bumper marks were found along the last 650 yd. of the runway after the crash.

► **No Engine Failure**—The MCA investigators said they found no failure or malfunctioning of the Comet's airframe or engines. All instruments worked within tolerances, they reported, and all fire prevention units (inertia switches, crash switch operating levers, and methyl-bromide fire extinguishers) operated correctly.

An indication of the degree of the Comet's nose-high attitude was taken from reports of takeoff tests made by de Havilland, builder of the jet airliner. The reports said an incidence of nine degrees results in a partially stalled wing, giving high drag that effects the aircraft's acceleration and other symptoms that were noticed by the pilot as low-frequency buffeting.

The BOAC pilot's manual specifies an incidence of from six to six-and-a-half degrees at "unstick" in order to give a six-inch movement of the control column back from neutral position.

► **May Be Replaced With New Series**—BOAC has taken no action as yet to replace the lost Comet with a new Series 1. The airframe and engines of the crashed Comet now are in the hands of underwriters.

SHORTLINES

► **Air Transport Assn.** soon may revise its prediction that passenger volume on scheduled domestic airlines will jump 25% from this year's 26 million to 33 million in 1955, and 58% from this year to 41 million by 1960; and that mail will gain 41% and air cargo 56% by 1960. Coach and all-cargo aircraft may boost the growth trend. ATA reports nearly 600 extra-section flights scheduled in the U. S. for the holiday traffic, including more than 100 military charters and substantial extra cargo and mail moves.

► **All-American Airways** changes its name to Allegheny Airlines Jan. 1.

► **American Airlines** will have its first two 80-passenger DC-6 coaches flying early next month, and 11 by summer . . . Company hauled more than 4 million ton-miles of airfreight in November, its second consecutive 4 million-plus month. This is a 30% increase over a year ago.

► **Avianca** plans fortnightly European service to either Frankfort or Hamburg, Germany, starting early in 1953 and expanding as new equipment becomes available.

► **Civil Aeronautics Board** has won another round in its fight to control nonscheduled airline ticket agent practices. The U. S. Court of Appeals, New Orleans, dismissed for lack of prosecution Miami Airline's appeal of an injunction by the Southern District Court of Florida. The airline was enjoined from carrying persons sent by ticket agents with whom it had no written agreement or passengers who were not ticketed for Miami Airline.

► **Eastern Air Lines** will have completed within 14 months internal and bank-credit financing of its $110-million flight equipment program that includes 60 Martin 4-0-4s and 14 Super Constellations already delivered, plus 16 compound-engine Super Connies next summer. President E. V. Rickenbacker outlined the program's progress in a report to employe shareholders, who now own "substantially more than 20% of the company and constitute the largest single owner."

► **National Production Authority's** Aircraft Section has DPA approval of full civil aircraft production materials allocations asked for the second quarter of 1953 (the "C-9 program").

► **Northwest Airlines** has set an identical fare for both Calgary and Edmonton in Canada's oil boom and vacation area.

► **Pan American-Grace Airways** has a newly established "Five Trophy" presented by pioneer commercial aviator Jack Frye, "for operating the fastest U. S. commercial passenger flight on a regularly scheduled service." Selection was made by Alexander de Seversky, C. S. Jones and John B. Walker. The service is Panagra's Miami-Buenos Aires DC-6, powered by new Pratt & Whitney CB-16 engines.

► **Seaboard & Western Airlines** trans-Atlantic commercial air cargo volume gained 10% the first three quarters of 1952 over a year ago. Germany ranked first in both import and export volume, with France and Switzerland next. S&WA President Raymond Norden predicts the industry's trans-Atlantic airfreight volume will gain 340% over last year by 1955 to 160 million ton-miles and triple that to 450 million by 1960. He bases these projections on lower rates made possible by all-cargo DC-6As and Super Constellations. The company has acquired its ninth DC-4 and slated it for future use on its Atlantic freight service.

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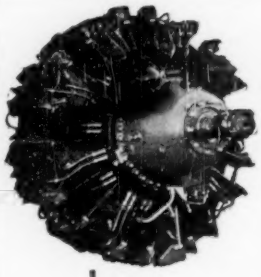

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16	R1820-54 Low total time since new	4	R1820-62 NTSN

PRATT & WHITNEY

1 R1830-43 LTSO

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Various Sizes—Shatter Proof
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Quantity	Part No.	Mfg.	Description
20	36001-0	Eclipse	Compass
11	14601-1F-B1	Eclipse	Gyro Indicator
71	828TY13Z2	Weston	Oil Temp Indicator
40	119868	Weston	Carb. Air Temp Indicator
10	15401-1	Eclipse	Amplifier (PB10)w/ED3 MOUNT
66	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000PSI)
327	PF4-713-20BCE	Vickers	Hydraulic Pump
75	1416-12E	Eclipse	Starter
149	98008	Aireserch	Jack (Cowl FLAP)
45	AN4103-8	Clifford	Brass (Valve #U4785) Oil Cooler
120	MF9-713-15A	Vickers	Hydraulic Pump
550	IFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
1000	AN5780-2	G E	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
115	P4CA2A	Parker	Primer
70	AN3213-1	Scintilla	Ignition Switch
450	A-9 (94-32926)	Nesco	Ignition Switch
90	JH950-R	Jack & Heinz	Starter Motor
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I.
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Berber-Colman	Control
11	12086-1C	Eclipse	Amplifier
230	558-1A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
89	316	Edwards	Horn
230	921-B	Stewart-Warner	Heater (200000 BTU)
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Resulator
65	ASDC2	CO_2 Mfg. Co.	Fire Detector
384	564-2A	Eclipse	Oil Separator

PRATT AND WHITNEY AIRCRAFT ENGINE PARTS

Quantity	Part No.	Description
166	1045	Bearing
500	3506	Flange
130	8288	Follower Ass'y
814	35814	Blower Ass'y
53	48362	Shaft
75	48363	Shaft
56	48399	Sump
390	48461	Gear
78	76536	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
200	84083	Cylinder
100	84084	Cylinder
200	84085	Cylinder

CARBURETORS! MAGNETOS! SPARK PLUGS!

Quantity	Part No.	Description
247	PD12K10	Stromberg Injection Carburetor
19	1375F	Holley carburetor
407	SF9LN-2 (manufacturer's part No. 10-12453-6 Spec. AN9511)	Bendix Scintilla Magneto
42	SF5RN-12 (manufacturer's part No. 10-26170-1)	Bendix Scintilla Magneto
185,000	LS4AD1	Spark Plug (Aero)

SPECIAL GROUP!

Ideal for tear-down for parts

Quantity	Part No.	Description
328	PD12K10	Stromberg injection carburetor
236	PR48-A1	Stromberg carburetor

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LETTERS

'Stretching' Engineers

Concerning your recent article, "A Plan for Stretching Engineering Supply," an additional source of engineers can be found at the drafting tables and planning desks in industry itself.

Obviously, as the normal output of the colleges cannot supply the ever-increasing requirements for engineers, industry must bestir itself to make arrangements with accredited institutions to train the technical personnel it now employs to qualify as engineers.

A system of tests may be set up to determine the fitness of such personnel for additional formal schooling, in order to protect the interests of industry. Employes already partially schooled in engineering would receive the earliest advantages. The aircraft industry, particularly, with multitudes of draftsmen, layout men, toll designers, planners etc., is well supplied with men and women whose worth and inductivity already have been established.

Rumors persist throughout industry that one company or another already has inaugurated such educational programs, offering them as inducement to prospective employes. Upon investigation, these rumors prove to be false, even in areas in which technical colleges and universities and aircraft industry establishments co-exist. Retraining of graduate engineers seems to be the maximum extent of existing training programs in the aviation industry.

Ambitious employes, who meet reasonable requirements for additional formal schooling, should have time and facilities available to them, either at the company or at a nearby educational institution. These courses, maintained at company expense, will enhance the employe's opportunities to advance in the company, and eventually lead to the various degrees in engineering for which he is best suited and which simultaneously meet the company's needs.

A plan by which the company would release an employe an hour for each hour the employe devotes of his own time to such studies would seem a desirable arrangement to assure honest effort on the part of the individual. Other plans might be equally feasible.

With the shortage of personnel what it is, and the pressure on industry to produce, further delay in consideration of a bonafide training program seems unwise indeed.

TOM E. MOORE
Manufacturing Engineering Dept.
Kaman Aircraft Corporation
Windsor Locks, Conn.

Titanium Specs

I'm sure that in your titanium specifications story, page 18, Oct. 6, you meant Aeronautical Material Specifications and not American Material Specifications as listed.

Aeronautical Material Specifications are published by SAE in a general series of aeronautical documents covering all areas of aeronautical materials, i.e., steels, plastics, rubbers, low alloys and coppers, etc.

We are in the process of issuing five titanium specifications.

M. LEROY STONER, Manager
Aeronautical Department
Society of Automotive Engineers, Inc.
29 West 39th Street
New York 18, N. Y.

(AVIATION WEEK regrets the typographical error—ED.)

'Correct Story'

On behalf of Maj. Gen. Clarence S. Irvine, deputy commander for production, Air Materiel Command, I wish to express our thanks for the correct story concerning the Air Force program in connection with the Northrop F-89.

The new story corrects a lot of erroneous impressions concerning the F-89, and it was most helpful to us to have those impressions corrected. . . .

LT. COL. JULIAN B. CROSS, USAF
Deputy-Public Information Officer
HQ, Air Materiel Command
Wright-Patterson Air Force Base, Ohio

Induced Drag

David Anderton's article on the H.D. 31 was highly interesting, but one thing needs correction. The writer says the induced drag is an inverse function of the aspect ratio. Of course, we all know that this isn't so; and in no equation for induced drag, per se, does the aspect ratio appear. What Anderton meant was that the induced drag coefficient is an inverse function of the aspect ratio.

AVIATION WEEK asked for criticisms a few weeks ago and here's one. Let's have some articles on aerodynamics.

GEORGE W. CHRISTIE, JR.
Red Lake Falls Gazette
Red Lake Falls, Minn.

Praise

I look forward to the new issue of AVIATION WEEK to keep me informed regarding the activities in the aircraft industry. Your straight-forward report of government and political interference in the aircraft industry is certainly commendable.

WILLIAM H. COLEMAN,
Executive Vice President
Lyons-Coleman, Inc.
P. O. Box 6028
Dallas, Tex.

Dave Anderton's recent article on the gas-turbine-powered helicopter was excellent. We most certainly appreciate such a fine presentation of what we believe is an important step forward in the rotary-wing field.

CHARLES KIRCHNER,
Asst. to the President
Kaman Aircraft Corp.
Windsor Locks, Conn.

STRICTLY PERSONAL

More Complexity

AVIATION WEEK's **Bob Hotz** discovered in England that an essential equipment item in the new Avro delta jet is a coat hanger. Test Pilot **Roly Falk** flies the big bomber in a business suit, and hangs up his coat when he really goes to work pushing the 100,000-lb. delta around all by himself.

* * *

High-Balling

Leslie Berg, a Strictly Personal reader in Evansville, Ind., sends us a news story from the UP: "The Long Island RR congratulated itself yesterday on its efficiency for the month of November. The railroad said only 470 trains were late, compared to 1,188 for the same month last year."

* * *

People

Well-known **Charlie Rochester**, prexy of New York's Lexington Hotel, was married the other day in Lakeland, Fla., at the home of **Al Lodwick**. The bride was **Miss Theresa Bagley**, of Roxbury, Mass. She was his nurse during a long illness. . . . **Col. Bill Westlake** becomes PIO for Allied Land Forces, Southeastern Europe, stationed at Izmir, Turkey. . . . AVIATION WEEK's **George Christian** ran across a real aviation Old Timer in Manila. He's **William Kadra**, now Philippine Air Lines Supt. of International Maintenance. Bill started in aviation by joining Zeppelin in 1916, then went to Fokker, getting into commercial airlines in 1926.

* * *

Twin Jets in Dallas

Keith Baker, publicist for Chance Vought of Dallas, the well-known makers of the twin-jet F7U-3, announces that their new BuAer rep. is **Capt. Charles M. Jett**, and he's the father of twins.

* * *

Monster Cuts Up

While talking on the phone with a chatty American Airlines reservation girl, **Phil Klass** (our Avionics, and bachelor, editor) picked up a sidelight of progress a few weeks ago, right after American installed its new and wondrous electronic reservations computer. It seems the monster either got stuck or too ambitious and oversold about a dozen seats on most of AA's flights for one particular day. Trouble's fixed, thank you.

* * *

You Can't Please 'Em

Most women are born bargain-lovers but one marched into the Los Angeles United Air Lines ticket office the other day with a chip on her shoulder.

"How about this plan you have for Mondays, Tuesdays and Wednesdays," she demanded, "where a wife is only worth half her value?"

* * *

AOPA Wouldn't Like It

The de Havilland Gazette quotes a Vampire pilot in Malaya: "During the rainy season we report altitudes in fathoms."

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Complete FACILITIES for ALL TYPES AIRCRAFT

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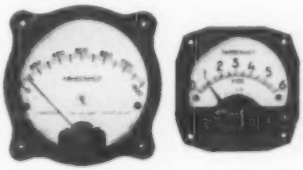
Indicating Pyrometers

for temperature testing in the laboratory or in the plane...

Constructed with the same care as our aircraft temperature indicators, these pyrometers bring "aircraft quality" to the test engineer.

MODEL 58PY, above, has been used extensively by leading motor car manufacturers for road testing on the "Proving Grounds" — where performance counts. Housed in rectangular bakelite case, has 6" hand drawn scale and is fully compensated for ambient temperature. Made in ranges listed below, with suitable thermocouple materials.



MODEL 23B, left above, has same type movement as our aircraft pyrometers. Housed in flanged, 4" round, bakelite case for panel mounting.

MODEL 20B, right above, has same 3" steel case and same movement as our aircraft panel indicators. Both are fully cold-end compensated and available in standard ranges listed, with suitable thermocouple materials.

STANDARD RANGES—All Models

FAHRENHEIT
Zero to 400, 600, 800, 1000, 1200, 1600, 1800, 2000 and 2500.

CENTIGRADE
Zero to 200, 300, 400, 500, 600, 800, 1000, 1100 and 1400.

Furnished with white scales, black markings and pointer or, with black scales white markings and pointer if specified. For best results use LEWIS Thermocouples, Leads and Selector Switches with these instruments.

THE LEWIS ENGINEERING CO.
Manufacturers of Complete Temperature Measuring Systems for Aircraft
NAUGATUCK, CONNECTICUT

EDITORIAL

What's CAA Doing About It?

The Civil Aeronautics Administration's information office told a national magazine recently that one of its articles critical of CAA, and others, really involved malfunctions of automatic feathering of propellers as well as of reversible propellers.

Since the theme of the article was reversible props, CAA thus accused the magazine of inaccuracies.

After a briefing on automatic feathering difficulties, we are inclined to ask the two chiefs of the Office of Aviation Safety, Ernest Hensley, and his assistant, William Davis, what they have been doing to clean up these automatic feathering problems, that are as dangerous potentially as the well-publicized malfunctions of reversible propellers.

We have made a spot check, that fails to disclose satisfactory action by Messrs. Hensley and Davis. We find that experienced men in CAA are aware of the hazards but are powerless to swing decisive action. One of these experts explains it this way:

A heavily loaded twin-engine aircraft (CAA authorizes higher gross loads if the plane is equipped with automatic feathering) suddenly loses 50% of its power at takeoff, the most critical portion of flight. The power loss develops not because anything is wrong with the engine, but because of gadget malfunction.

Here is a typical example of an actual case, one of scores, taken from CAA's Daily Mechanical Reports:

"On takeoff, right propeller auto feathered, with arming circuits on, no evidence of malfunctioning of engine. Engine was unfeathered and operated normally and flight proceeded to ——. Inspection revealed leak in torque pressure line at torque pressure switch, which caused auto feathering. Also changed feathering switch, auto feathering relay box, propeller governor and torque switch as a precautionary measure. Propeller circuits were inspected and found normal."

When is a safety gadget not safe? Suppose the other engine had failed at the same time? After thorough investigation of the fatal accident would the following perhaps have been contained in the "findings" or "probable cause"?

"During takeoff the left engine apparently failed and auto-feathered. Aircraft could have been safely continued in flight with the proper flying technique since right engine was found to be entirely airworthy; however, evidence indicates one of the pilots feathered the good engine, thus depriving the aircraft of power, after which the crash occurred."

Experts who deplore the current laxity in the Office of Aviation Safety on this subject also send us another example from the Daily Mechanical Reports, this one involving a four-engine aircraft:

"Aircraft returned account No. 4 propeller feathered in cruise without warning. Additional information advises that Maintenance ground-checked propeller operation with engine running and were unable to duplicate the condition. No. 4 propeller governor and feathering switch were changed as a precautionary measure. Entire propeller electrical control circuit was checked and found normal. Aircraft was test flown and again condition could not be duplicated. Aircraft returned to service."

Now, Messrs. Hensley and Davis, what is your "administratively qualified" brain trust doing about these and other hazards of aviation?

Tackling Airline Costs

Northwest Airlines discloses in a press release some of the costs of providing luxury accommodations at no extra charge for its first-class passengers.

"Every seat ash tray costs $14.40 and it requires 75 to each Stratocruiser," the company says. "Fittings for the ash tray are listed at $116 each, while drinking glass holders are $6.77, stairwell retaining rope $11, stairwell hand rail $70.75, luxury compartment chair $1,192, seat arm rests, $192. . . ."

Northwest says total costs of parts and supplies it must keep on hand at all times, including 50,000 parts for the Stratocruiser alone, amount to about $11,500,000.

Some carriers have been making more progress against high costs and complexity than others. The local service lines and operators stressing lower fare coach service have led the field, but everybody has a long way to go before the masses fly.

Don't misunderstand us. If the passenger, in order to get his luxury, is willing to pay for extra costs, including whatever mail subsidy may be involved, then it is his privilege to do so. That is the American way.

But in order to please the luxury rider don't let us penalize the little fellow, and by enforcing high fares deny him the opportunity to fly safely.

Why should we forfeit millions of travelers to trains, buses and cars without a struggle? We'll be glad we have the masses already sold when or if we hit a national business depression. We'll also be glad we will have mastered complexity and costs.

Some of the airline luxury proponents have been trying to shoot holes in the lower costs of carriers that specialize in coach services. They have sought to imply strongly that higher costs always bring greater passenger safety.

It is hard to imagine a nonscheduled carrier, for example, consenting to pay $14.40 apiece for its ash trays, $116 for every ash tray fitting, $6.77 for drinking glass holders, $11 for retaining rope, $70.75 for a hand rail, and $192 for an arm rest.

It also is hard to imagine how extra expenditures for such items as Northwest mentions could improve the passenger's safety. It is a good guess, however, that they help keep fares as high as the traffic will bear.

As Northwest would be among the first to concede—since it offers both coach and luxury flights—there are many cost differences between classes of service, and not all of them involve the safety element, by any means.

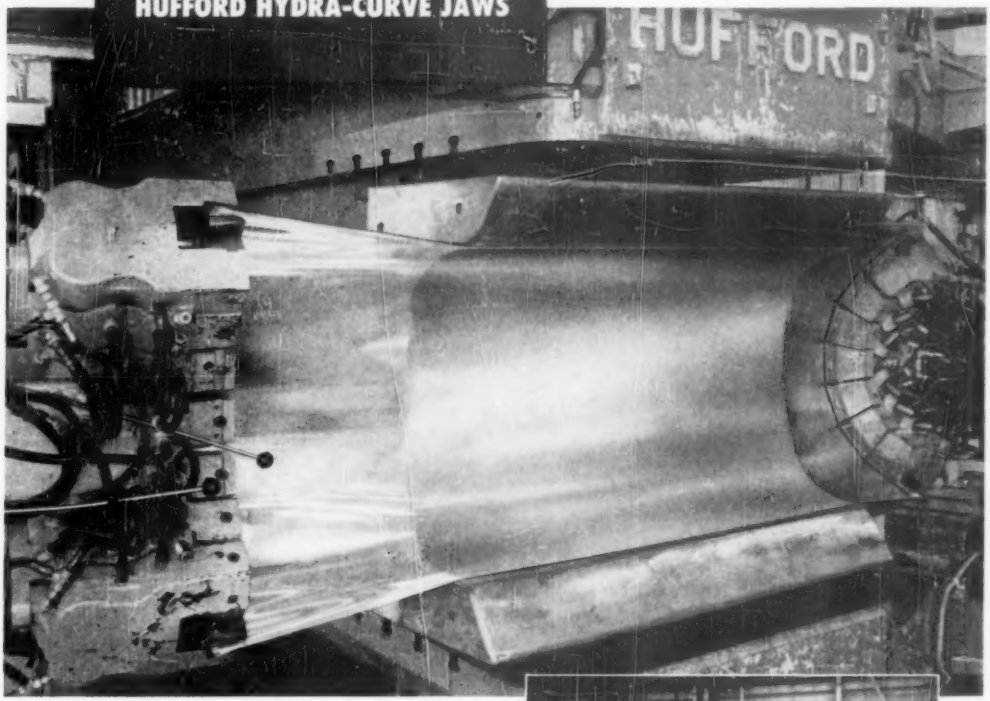
Someday, someone will start really tackling aircraft and service complexity, and high costs. When he does, we suspect progress will spurt a little faster. The public, as well as aviation itself, will be the winner.

—Robert H. Wood

"Bath-Tub" Deep!

HUFFORD HYDRA-CURVE JAWS

Here's the latest Hufford development that simplifies stretch-wrap forming of deep concavities or convexities. By pre-curving sheets to approximate cross sectional die contour these new HYDRA-CURVE JAWS bring many advantages:



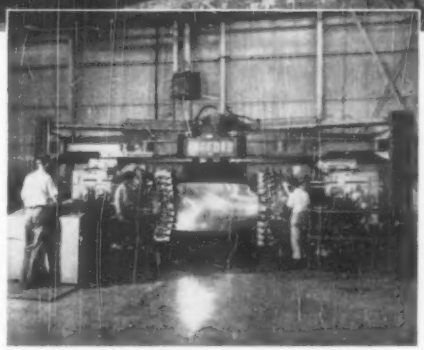
LESS STOCK USED—Vertical die curves no longer need to be *stretched* into the workpiece. Less stretching results in lower stressing. On deep curvatures this means *less stock required between die ends and jaws.* Result: Up to 30% savings in material.

DOLLAR SAVINGS—One manufacturer reports material savings of $335 per day, besides faster, easier forming and more accurate skin fits, which again cut costs.

LESS WRINKLING—No need to stretch wrinkles *out* of the workpiece. Pre-curving eliminates most wrinkling *before it starts.*

SAVES FURNACE HOURS—Many parts are now formed directly from material in the "ST" condition.

DIE COSTS CUT—Time consuming dish-outs in dies—to help reduce transitional stresses—are no longer necessary.



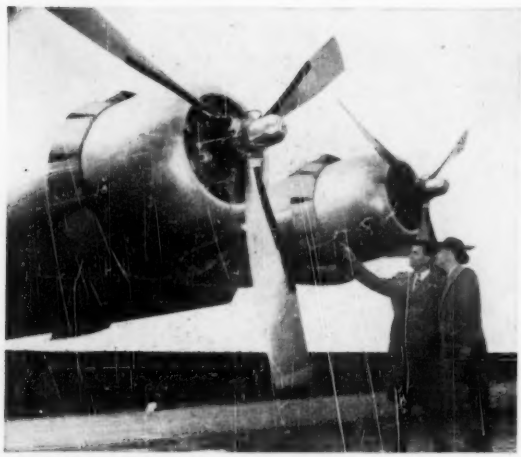
Once again, here's proof that the *BEST* in stretch-wrap forming comes *FIRST* from HUFFORD! Ask for facts.

HUFFORD
Machine Works Inc.
EL SEGUNDO, CALIFORNIA

Manufacturers of

HERE'S DRAMATIC PROOF of the damage an arcing fault can cause in an aircraft. To get this picture, G-E engineers arranged a mockup of an aircraft electrical system, then touched the generator power cable against a test airframe. Note the white-hot glare at point-of-contact!

G-E "PROTECTION RESEARCH" REDUCES ARC-FAULT HAZARDS IN AIRCRAFT



G-E AVIATION SPECIALIST and customer discuss protective measures for commercial air transport. G-E protective systems are now installed on DC-6Bs, Stratocruisers, the Navy s new F3H, and Lockheed Constellations.

Each week, G-E engineers at Schenectady, N. Y., are furthering their "protection research" on aircraft generator systems. And a single glance at the above photograph will tell you why.

One serious arc-fault like that shown above, in just one of your aircraft, could cost more than protective devices for an entire fleet. That's why today G-E protective panels and associated components are being designed to give generator systems *maximum* protection.

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